Technical Report GL-94-39
November 1994

US Army Corps of Engineers
Waterways Experiment Station

In Situ Shear Wave Measurements for Evaluating Dynamic Soil Properties at the Bannister Federal Complex, Kansas City, Missouri

by José L. Llopis, Thomas B. Kean II

Prepared for U.S. Department of Energy

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Final report

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Prepared for U.S. Department of Energy, Kansas City Area Office
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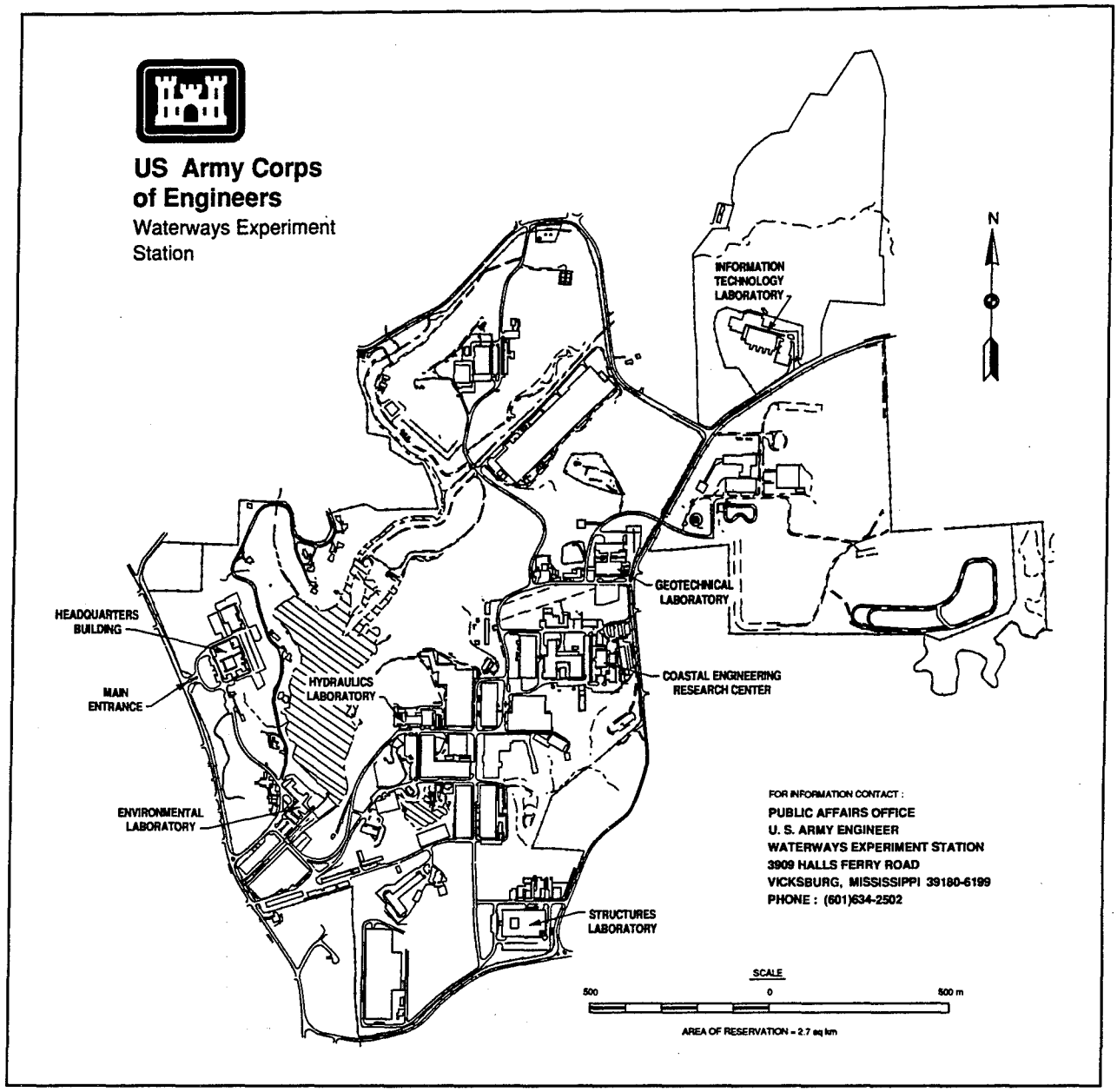

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Contents

Preface

A subsurface site investigation was conducted and supervised by personnel of the U.S. Army Engineer Waterways Experiment Station (WES), at the Bannister Federal Complex, Kansas City, Missouri, during the period 25 June to 1 July 1994. The work was funded under MIPR KC-94-114 dated 12 May 1994.

Mr. José L. Llopis of the Engineering Geophysics Branch (EGB), Earthquake Engineering and Geosciences Division (EEGD), Geotechnical Laboratory (GL), WES, was the project engineer. The crosshole S-wave velocity field investigation was performed by Messrs. José L. Llopis and Thomas B. Kean II, EGB. The S-wave crosshole test borings were installed by personnel of the U.S. Army Engineer District, Kansas City, (CEMRK) during 23 May to 1 June 1994. Crosshole borings and seismic cone penetrometer test (SCPT) push locations were surveyed by CEMRK personnel. Mr. Steve Jirousek was the CEMRK project geologist. The SCPT's were performed by Mr. Spencer A. Vandehey, Vandehey Soil Exploration, Banks, Oregon. Messrs. Raymond Meis and Mark Drury were the U.S. Department of Energy, Kansas City Area Office, and Allied-Signal Aerospace Corporation project managers, respectively.

The work was performed under the direct supervision of Mr. Joseph R. Curro, Jr., Chief, EGB, and under the general supervision of Drs. A. G. Franklin, Chief, EEGD, and William F. Marcuson III, Chief, GL.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Bruce K. Howard, EN.

Conversion Factors, Non-SI to SI Units of Measurement

Non-Si units of measurement used in this report can be converted to SI units as follows:

Multiply	By	To Obtain
degrees (angle)	0.01745329	radians
feet	0.3048	meters
feet per second	0.3048	meters per second
gallons	3.785412	cubic decimeters
inches	2.54	centimeters
inches per second	2.54	centimeters per second
miles (US statute)	1.609347	kilometers
pounds (force)	4.448222	newtons
tons per square foot	95.76052	kilopascals

1 Introduction

Current computerized seismic wave propagation analysis procedures for building foundations require that values of shear-wave (S-wave) propagation velocities as a function of depth be determined. The S-wave velocities are used in conjunction with conventional field sampling and laboratory testing to provide soil property information for a dynamic analysis of buildings and their foundations.

The Bannister Federal Complex (BFC) is located in southern Kansas City, MO, at 2000 East 95th Street, as shown in Figure 1. The BFC is a Federal facility that consists chiefly of one large main building along with an assemblage of smaller surrounding structures. The main building has approximate dimensions of 900 by 1600 ft and is occupied by the U.S. General Services Administration (GSA), the U.S. Marine Corps, and the U.S. Department of Energy (DOE). The DOE administers a manufacturing facility in the eastern portion of the main building which is operated, under contract, by the Allied-Signal Aerospace Corporation.

The DOE concerns about the potential damaging effects on manufacturing facilities and processes by seismic loadings has prompted a dynamic analysis to be initiated. At the request of the DOE the U.S. Army Engineer Waterways Experiment Station (WES) conducted a subsurface site investigation to characterize in situ S-wave velocities and other physical properties related to the foundation in the vicinity of the main building at the BFC. The information acquired from this investigation will be used in a dynamic analysis to determine the effects of seismic loadings on the main building and to aid in designing any needed structural modifications.

The WES/DOE finalized test program consisted of crosshole S-wave, seismic cone penetrometer testing (SCPT), and laboratory soil analysis which would provide the data necessary to complete an analysis of the building's response to earthquake loadings. The location of the crosshole sets and SCPT pushes are shown in Figure 2. The crosshole and SCPT push locations shown in Figure 2 are approximate locations. The surveyed crosshole and SCPT push coordinates and elevations are given in Appendix A.

The BFC is located on flood plain deposits of Indian Creek which flows easterly south of the plant. This creek joins the Blue River southeast of the plant with the resulting flow bordering the east property line. Previous studies have indicated that the site is underlain by approximately 40 ft of clay alluvium and which is also underlain by a basal clay-gravel layer. Underlying the clay-gravel layer is a shaly bedrock of the Pleasonton Group. The site is predominantly level with the exception being the bluff line on the northern portion of the site.

2 Test Principles and Procedures

Crosshole S-wave tests

The purpose of running crosshole tests was to determine horizontal S-wave velocities as a function of depth. An advantage of the crosshole test as opposed to surface seismic refraction test is its ability to detect low velocity layers underlying or sandwiched between layers of higher velocity. One shortcoming of the crosshole method is that boreholes are required for testing. Thus, crosshole tests seismic tests are more costly than a surface seismic refraction test. However, the crosshole technique is considered to be more definitive and accurate than the surface seismic refraction test for measuring S-wave velocities. Basically, the testing consists of measuring the arrival time of an S-wave that has traveled from a source in one borehole to a detector in another borehole(s) at the same elevation. This procedure is then repeated for the next test elevation. Knowing the distance between borings and the time the S-waves take to travel across this distance the velocity can be computed (distance divided by time).

Two crosshole sets were used for crosshole testing and their locations are shown in Figure 2. Each crosshole set consisted of three in-line borings spaced approximately 10 ft apart. Borings D-40, D-41, and D-42 which were used for the crosshole set located in the northeast parking lot were drilled to depths of approximately 52 ft, whereas borings D-43, D-44, and D-45 used for the crosshole set in the southeastern parking lot were drilled to approximate depths of 57 ft. The borings were designed to penetrate approximately 10 ft of bedrock. The crosshole borings, with a diameter of 6.25 in., were cased with a 4-in. inside diameter (ID) Schedule 40 polyvinyl chloride (PVC) casing and the bottom capped. The annular space between the casing and the walls of the boring were grouted with a material that approximated the density of the surrounding in situ material. In this case, a mixture obtained by mixing 10 lbs. of bentonite and 10 lbs. of portland cement to approximately 7.5 gal. of water was used. The cap at the bottom of the boring consisted of a one-way valve that was fitted for a tremie pipe attachment. The tremie pipe was placed through the inside of the casing and attached to the bottom check valve. Grouting was carried out in one continuous operation by pumping grout through the tremie pipe, filling the

annular space between the drilled hole and the casing, from the bottom of the borehole to the surface.

Borehole deviation (drift) surveys were conducted to determine the precise vertical alignment of each boring. Figure 3 shows the deviation probe and instrumentation used to conduct the borehole deviation surveys. The incremental borehole deviation for each elevation along with the total deviation for the boring are indicated on the control panel. Accurate reduction of data from the crosshole tests requires knowledge of the drift of each boring so that a straight-line distance between borings at each test depth can be established.

S-wave velocity measurements were obtained by placing an S-wave source in the center hole (source hole) of each crosshole set and detectors, at the same elevation, in the two outer boreholes (receiver holes). The detectors consisted of a triaxial array of geophones, or velocity transducers, (two mounted horizontally at 90 deg. to each other, and one vertically oriented) in one container. The container housing the geophones was clamped firmly to the casing wall by means of an expanding pneumatic piston. A downhole vibrator was used as a source of vertically polarized S-waves. The S-wave testing procedure consisted of lowering the vibrator in the borehole to a selected test elevation and clamping the vibrator firmly to the sidewalls of casing also with an expanding pneumatic piston. When the vibrator was in position, the operator tested a range of frequencies (50 to 250 Hz) and selected one that propagated well (one with a high amplitude) through the transmitting medium. The time required for the S-wave to travel from source to receiver hole was recorded using a portable, 24-channel seismograph with data-enhancement capability. This procedure was repeated at 5-ft depth intervals from a depth of 5 ft to the bottom of the borehole. Figure 4 illustrates the crosshole S-wave technique. An analysis of the crosshole data obtained at each test elevation was made with the aid of the computer program CROSSHOLE developed at WES (Butler, Skoglund and Landers 1978). Further information regarding geophysical testing and interpretation procedures used in this study is given in Engineer Manual EM 110-1-1802 (Department of the Army 1979).

Soil sampling and testing

Standard penetration tests (SPT's) were conducted at 5 ft intervals in borings D-40 and D-43, the center borings of the northeast and southeast parking lot crosshole sets, respectively. The SPT blow counts, or N-value, can be used to relate engineering behavior of soils to widely published correlations. The SPT's were conducted in strict compliance to ASTM Designation: D 1586-84. For this investigation refusal was defined as 50 blows per foot.

Soil samples were collected from borings D-40 and D-43 at 5-ft. intervals. The samples were placed in jars, sealed and sent to the U.S. Army Engineer

Missouri River Division Laboratory for further visual examination and classification. Soil tests included grain-size distribution, natural water content, Atterberg limits, and soil classification according to the Unified Soil Classification System (USCS) for each soil sample. Laboratory testing was performed between 12 and 14 July 1994. The laboratory tests were performed in accordance to procedures described in Engineer Manual EM 1110-2-1906 (Department of the Army 1970).

Field logs of each boring were prepared by the drill crew. The logs include visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Also recorded on the logs are the SPT blow counts and soil sample locations.

Seismic cone penetrometer test

The cone penetrometer test (CPT) was originally developed in Europe as a rapid and cost-effective means of determining soil stratigraphy and soil strength parameters. It is now used extensively for off-shore and on-shore geotechnical applications. The cone used for this investigation, besides having the capability to determine soil stratigraphy and soil strength parameters also allowed S-wave velocity measurements to be made.

The SCPT used for this investigation utilized a drill-rig-mounted hydraulically-powered push apparatus, to force the instrumented cone penetrometer into the soil media. The electric cone had a 60° cone tip with a 1.4-in. diameter, and included two load cells to simultaneously measure tip penetration resistance and skin, or sleeve, friction as the cone was advanced. The cone penetrometer was pushed at a rate of approximately 0.79 in/sec. Steel rods, 3.28 ft long, were used to push the cone penetrometer into the soil. Tip resistance, sleeve friction, and cone inclination measurements were taken at 0.33-ft. depth increments. A cable prethreaded through the center of the hollow push rods, connected the cone to the data acquisition system at the ground surface. Each SCPT was pushed to refusal. Because of the soil's lack of lateral support on the cone rods and concern over bending the rods refusal was arbitrarily set to a tip resistance value in excess of 100 to 125 Tsf. These measurements provide a continuous record of soil resistance to penetration which can be used to characterize the soil media in detail. The cone data can be interpreted to give a good continuous prediction of soil type and shear strength (Robertson and Campanella 1983). Full details of the design of an electronic cone are given by Campanella and Robertson, 1981.

Also embedded into the cone body is a small horizontally oriented geophone which allows S-wave velocity measurements to be taken. The downhole S-wave test was conducted by pushing the cone at an approximate rate of 0.79 in/sec to a depth of 4.59 ft and stopping further advancement. A horizontally polarized S-wave was then generated on the ground surface by striking the end of a steel beam, that was weighted down by the rear drill-rig levelling pads, with a switched sledgehammer. The geophone in the cone

body was positioned so that its axis was oriented parallel to the long axis of the steel beam (signal source) in order to detect the horizontal component of the shear wave arrival. The time the S-wave took to travel from the ground surface to the cone was measured and recorded. The cone was then pushed 3.28 ft. using the previous push rate, stopped and another S-wave measurement taken. This procedure was repeated at 3.28-ft intervals until refusal was encountered. The downhole S-wave technique is illustrated in Figure 5.

The S-wave arrival times for each test increment were plotted versus distance from the S-wave source (slant distance) as shown in Figure 6. Best fit straight line segments were then drawn through the plotted points. The slopes of the line segments correspond to the S-wave velocity for that particular depth range.

The cone was pushed at thirteen locations around the facility and their approximate locations are shown in Figure 2. The surveyed SCPT push locations and elevations are given in Appendix A. The SCPT push locations were selected to provide representative S-wave and stratigraphic information of the site. SCPT push locations 1 and 5 were located adjacent to the crosshole sets in the northeast and southeast lots, respectively. The purpose for these two pushes was to compare the downhole and crosshole derived S-wave velocities.

The SCPT is used to determine the velocity of horizontally polarized S-waves propagating vertically through the soil whereas, the crosshole test is used to determine the velocity of vertically polarized S-waves propagating horizontally through the soil. The combined use of these two methods may be used to determine the presence of possible velocity anisotropy. Velocity anisotropy many times can be measured in materials where the S-wave signal has to cross discontinuities such as bedding and fracture planes. For example consider a material that contains numerous beds whose thicknesses are thin relative to the distance between crosshole borings. In this case it would be expected that the downhole-measured S-wave velocities would be less than those measured using the crosshole method.

3 Test Results and Interpretation

Field and laboratory soils tests

The logs of the six boreholes drilled for the two crosshole tests are presented in Appendix B. The logs for the northeast parking lot, borings D-40, D-41, and D-42, show very similar results and indicate a silty lean clay from the near surface to a depth of approximately of 40 ft where a basal clay-gravel layer approximately 1 to 5 ft thick is encountered. The basal clay-gravel layer consists of fine to coarse, semi-rounded to angular limestone gravel in a clay matrix. Beneath the clay gravel at an average depth of 42 ft is the Pleasonton Group bedrock. The bedrock as described in the boring logs is soft to moderately hard shaly siltstone with a greenish-gray to light brown color.

The logs for the southeast parking lot (borings D-43, D-44, and D-45) indicate the same general stratigraphy as that recorded for the northeast lot with the exception being that the basal clay gravel layer and top of bedrock were encountered at approximate depths of 44 and 46 ft, respectively.

The boring logs indicate that in general, the N-values for the silty clays encountered at a depth of 5 ft had values ranging between 15 and 17 blows/ft and decreased to values ranging between 4 and 8 blows/ft below a depth of 10 ft. One anomalously high N-value of 18 blows/ft at a depth of 30 ft in boring D-40 is noted.

Summary tables of the soil laboratory analysis results for the northeast and southeast parking lots are given in Tables 1 and 2, respectively. Detailed laboratory results including grain size curves are presented in Appendix C. Most of the soil samples tested were classified either as a lean or sandy clay, CL, according to the USCS. Samples S-1 and S-6, obtained from boring D-40 (northeast lot), were classified as fat clay, CH, while sample S-8 was visually classified as clayey sandy gravel.

Table 1
Summary of Laboratory Soils Testing - Boring D-40 - Northeast Parking Lot

Sample	Depth, ft	Nat W%	LL	PL	PI	I_L	% Retained on #200 Sieve	% Passing #200 Sieve	*Blow Count	Classification
S-1	5.0-6.5	25.0	54	16	38	0.24	6.6	93.4	17	Very dark gray fat clay, CH
S-2	10.0-10.9	31.5	48	16	32	0.48	7.2	92.8	4	Dark gray and dark brown sandy clay, CL
S-3	15.0-16.5	29.0	43	18	25	0.44	8.2	91.8	8	Dark brown sandy clay, CL
S-4	20.0-21.5	30.6	39	15	24	0.65	7.8	92.2	4	Very dark gray lean clay, CL
S-5	25.0-26.4	31.5	40	18	22	0.61	7.7	92.3	5	Very dark gray lean clay, CL
S-6	30.0-31.5	26.6	53	19	34	0.22	5.8	94.2	18	Mottled gray and rust fat clay with some sand, CH
S-7	35.0-36.5	24.6	41	16	25	0.34	25.5	74.5	8	Mottled gray and rust sandy clay, CL
S-8	40.0-40.3		30	15	15					Dark brown clayey sandy gravel Note: Specimen too small for 4-point Atterberg.

LL - Liquid Limit
PL - Plastic Limit
PI - Plasticity Index
I_L - Liquidity Index

*Note: Field measured blow counts

Table 2
Summary of Laboratory Soils Testing - Boring D-43 - Southeast Parking Lot

Sample	Depth, ft	Nat W%	LL	PL	PI	I_L	% Retained on #200 Sieve	% Passing #200 Sieve	* Blow Count	Classification
S-1	5.0-6.5	26.0	45	17	28	0.32	7.3	92.7	15	Dark brown lean clay, CL
S-2	10.0-11.5	26.8	38	17	21	0.47	7.2	92.8	7	Dark brown lean clay, CL
S-3	15.0-16.5	26.7	38	17	21	0.46	5.9	94.1	5	Dark brown lean clay, CL
S-4	20.0-21.5	27.2	35	16	19	0.59	5.7	94.3	4	Dark brown lean clay, CL
S-5	25.0-26.3	32.3	42	18	24	0.60	4.7	95.3	5	Dark brown sandy clay, CL
S-6	30.0-31.5	34.9	42	17	25	0.72	4.2	95.8	4	Very dark gray lean clay, CL
S-7	35.0-36.3	28.5	46	17	29	0.40	8.0	92.0	5	Very dark gray lean clay, CL
S-8	40.0-41.5	30.4	41	16	25	0.58	8.2	91.8	7	Very dark gray lean clay, CL
S-9	45.0-45.4		33	16	17				50	Dark brown gravelly sandy clay, CL Note: Specimen too small for needed sieve analysis. Visual classification with atterberg limits.
S-10	?		26	13	13					Gray highly weathered shale. Lean clay, CL

LL - Liquid Limit
PL - Plastic Limit
PI - Plasticity Index
I_L - Liquidity Index

*Note: Field measured blow counts

Crosshole S-wave tests

The plotted results from program CROSSHOLE for the S-wave tests conducted in the crosshole sets located in the northeast and southeast parking lots are presented in Figures 7 and 8, respectively. The S-wave velocities and depth to interfaces agree very well for the two S-wave tests conducted in the northeast parking lot boring set. The velocities for the materials between depths of 5 and 37 ft ranged between approximately 400 and 725 fps and correspond to the clay soils. Between approximate depths of 37 and 41 ft a velocity of 1900 fps is indicated. This velocity corresponds to the depth at which a clay gravel material is indicated in the boring logs however, because of the likelihood of a refracted arrival caused by the proximity of the bedrock surface, it is likely that this velocity corresponds to a signal travelling both through bedrock and the clay gravel. The bedrock in this area had a velocity of approximately 2050 fps.

The velocities for the clay materials found between depths of 5 and 44 ft in the southeast parking lot borings ranged between approximately 500 and 725 fps. Bedrock in this area had a velocity of approximately 1750 fps which is approximately 300 fps slower than the bedrock velocity measured at the northeast parking lot. The 1750 fps bedrock velocity measured at the southeast lot may correspond to perhaps a softer or slightly more weathered bedrock than found at the northeast lot.

The S-wave data for both crosshole sets is presented in Figure 9. The figure illustrates the close velocity agreement of the clayey materials between both crosshole sets. The figure also indicates that the depth to bedrock was approximately 7 ft greater in the southeast boring set than in the northeast set. An S-wave velocity profile for the alluvium and bedrock was constructed based on the crosshole results and is presented in Table 3.

Table 3
Average Crosshole S-wave Velocities

Depth Range, ft	Average S-wave Velocity, fps	Material
5 to 12	475	Clay - Alluvium
12 to 21	600	Clay - Alluvium
21 to (37-46) bedrock	700	Clay - Alluvium
(37-46) to ?	1900	Shaly Siltstone - Bedrock

Seismic cone penetrometer tests

Complete SCPT results which include, for each push, separate plots of tip resistance, sleeve friction, friction ratio, cone inclination, and predicted N-value versus depth are presented in Appendix D. Also, presented for each push, are tabulated values of tip resistance, sleeve friction, friction ratio, cone inclination, and the interpreted soil type for each 3.94-in. push interval. The interpreted equivalent N-values and soil classifications were derived from the interactive computer program CPTINTR1 (Greig 1986). The interpretation methods used in CPTINTR1 for estimating equivalent N-values and the soil type are given in Robertson et al. 1983 and Robertson and Campanella 1983.

The plots of tip resistance versus depth commonly show values of less than 10 Tsf throughout the push with the exception of the upper 5 to 7 ft which at times have values in excess of 100 Tsf. Some of the pushes also indicated zones, some as thick as 5 ft, exhibiting higher tip resistance values between depths of 15 and 30 ft.

The sleeve friction versus depth plots basically exhibited the same pattern as the tip resistance plots. Recorded friction values generally showed values less than 0.25 Tsf for the majority of the push. Most of the pushes indicated higher sleeve friction values in upper 5 to 7 ft. Also, as was the case with the tip resistance plots, the sleeve friction plots also indicated zones with higher friction values between depths of 15 and 30 ft.

The plot of equivalent N-values versus depth also indicated fairly consistent values of less than 10 blows/ft throughout the SCPT push. These values agree very well with the SPT values obtained in the two crosshole borings. Again, as was previously displayed in the tip resistance and friction plots, some of the SCPT pushes exhibited higher N-values for the near surface soils and for zones, up to approximately 5 ft thick, between depths of 15 and 30 ft.

The downhole S-wave results, displayed as arrival time versus slant distance, for SCPT pushes 1 through 13 are presented in Figures 10 through 22, respectively. The interpreted downhole S-wave velocity profiles for the SCPT pushes along the east, south, west, and north side of the main building are presented in Figures 23 through 26, respectively. Each figure shows the velocity profiles corresponding to pushes collected along each side of the building. The velocities for the clay materials range between 350 and 775 fps. Two of the pushes, P-8 and P-11, appear to have partially penetrated the clay-gravel layer and the velocity for this layer is approximately 1100 fps.

Figure 27 shows a comparison of the downhole and crosshole S-wave velocities for the northeast and southeast parking lots. The results of the downhole S-waves obtained near the location of the crosshole borings agree very well with the crosshole S-waves. No evidence of any velocity anisotropy was observed i.e., vertically and horizontally propagating S-waves had similar velocities.

4 Summary

This report documents the results of an in situ geophysical investigation conducted in the vicinity of the main building at the Bannister Federal Complex, Kansas City, MO. The purpose of the investigation was to determine the soil and bedrock S-wave velocities of the site. The S-wave values will be used to perform a dynamic analysis of the main building and its foundation.

Laboratory tests on soil samples taken from crosshole borings indicated that the alluvial material across the site is basically a lean clay and according to the USCS a CL. Underlying the clay is a basal clay-gravel layer consisting of fine to coarse, semi-rounded to angular limestone gravel in a clay matrix. The bedrock belongs to the Pleasonton Group and is encountered at an approximate depth of 40 ft. The bedrock is described in the boring logs as a soft to moderately hard shaly siltstone with a greenish-gray to light brown color.

The SCPT was used to collect S-wave velocities, tip resistance and sleeve friction measurements at 13 locations around the main building. Tip resistance and sleeve friction measurements were used to make soil classification and N-values interpretations. The SCPT results indicated the presence of approximately 5-ft thick zones, between depths of 15 and 30 ft that showed slightly higher tip resistance and sleeve friction values. SCPT S-wave results in the alluvium indicated values which increased with depth, ranging between 350 and 775 fps. Two of the pushes, P-8 and P-11, appear to have partially penetrated the clay-gravel layer and the velocity for this layer is approximately 1100 fps.

Averaged crosshole S-wave results indicate values ranging between 475 and 700 fps for the clay materials. The S-wave velocities showed an increase with depth. The average S-wave velocity for the shaly siltstone (bedrock) was 1900 fps.

There was very good agreement between the S-wave results obtained from the SCPT and crosshole tests. Based on these results, if further S-wave measurements of the alluvial materials are needed it is recommended that they be collected using the SCPT. For the alluvial soils found at this site, S-waves

can be collected more economically using the SCPT rather than the crosshole method. However, if further rock velocities are needed it is recommended they be measured using the crosshole method.

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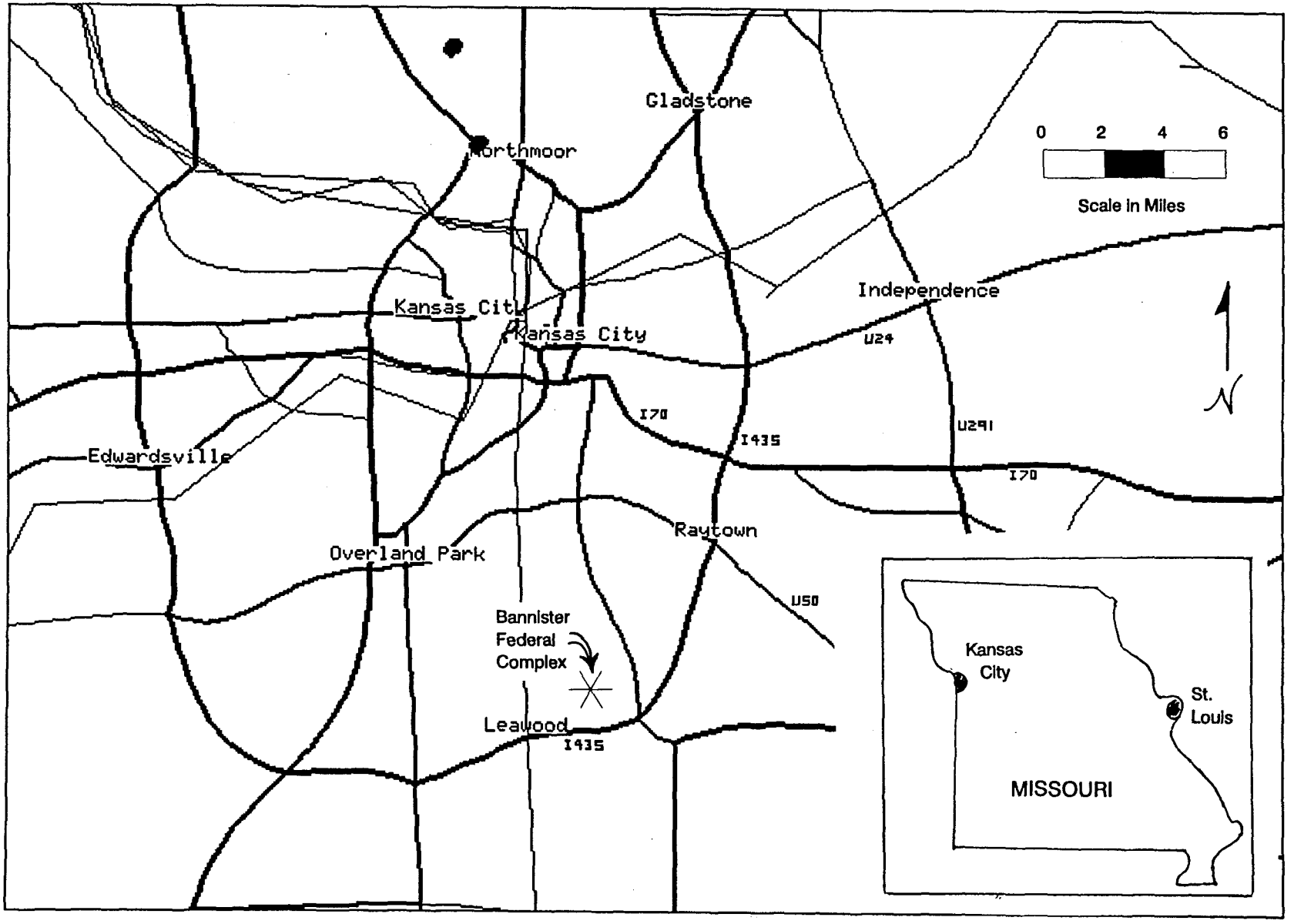


Figure 1. Locality map

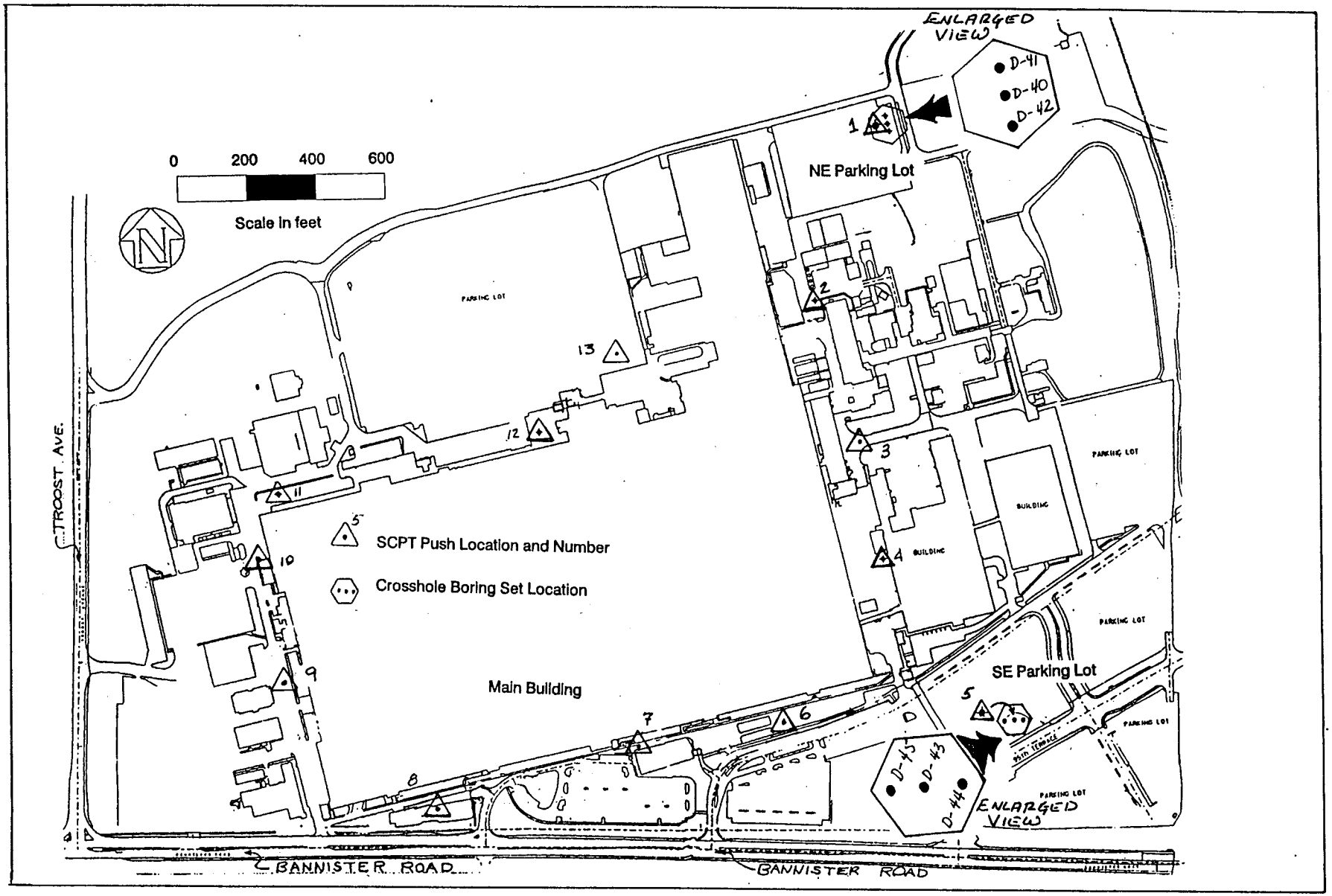
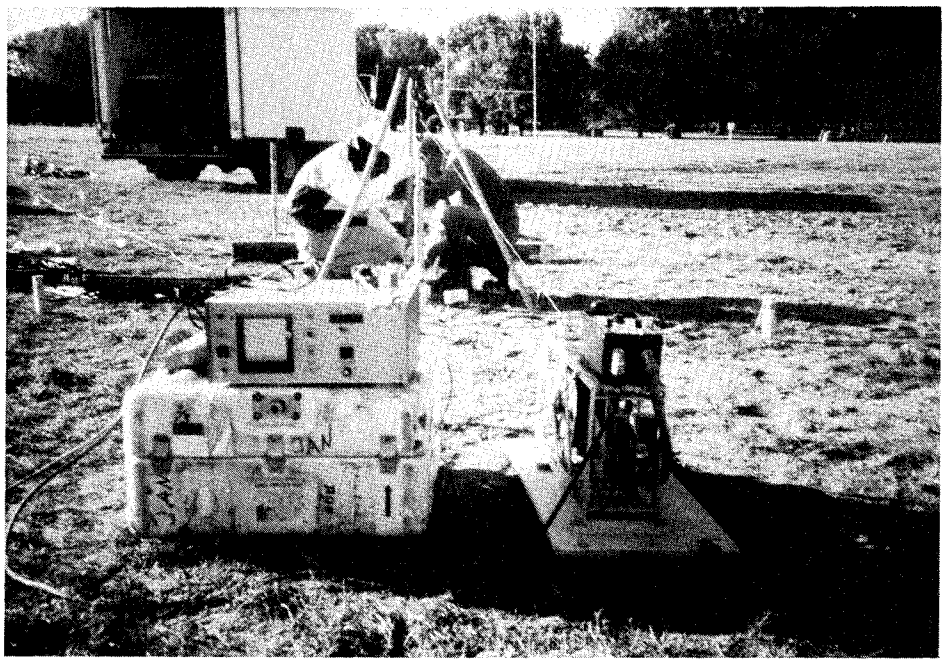


Figure 2. SCPT and crosshole boring locations

a. Deviation probe being lowered into boring



b. Surface control unit and winch

Figure 3. Borehole deviation tool

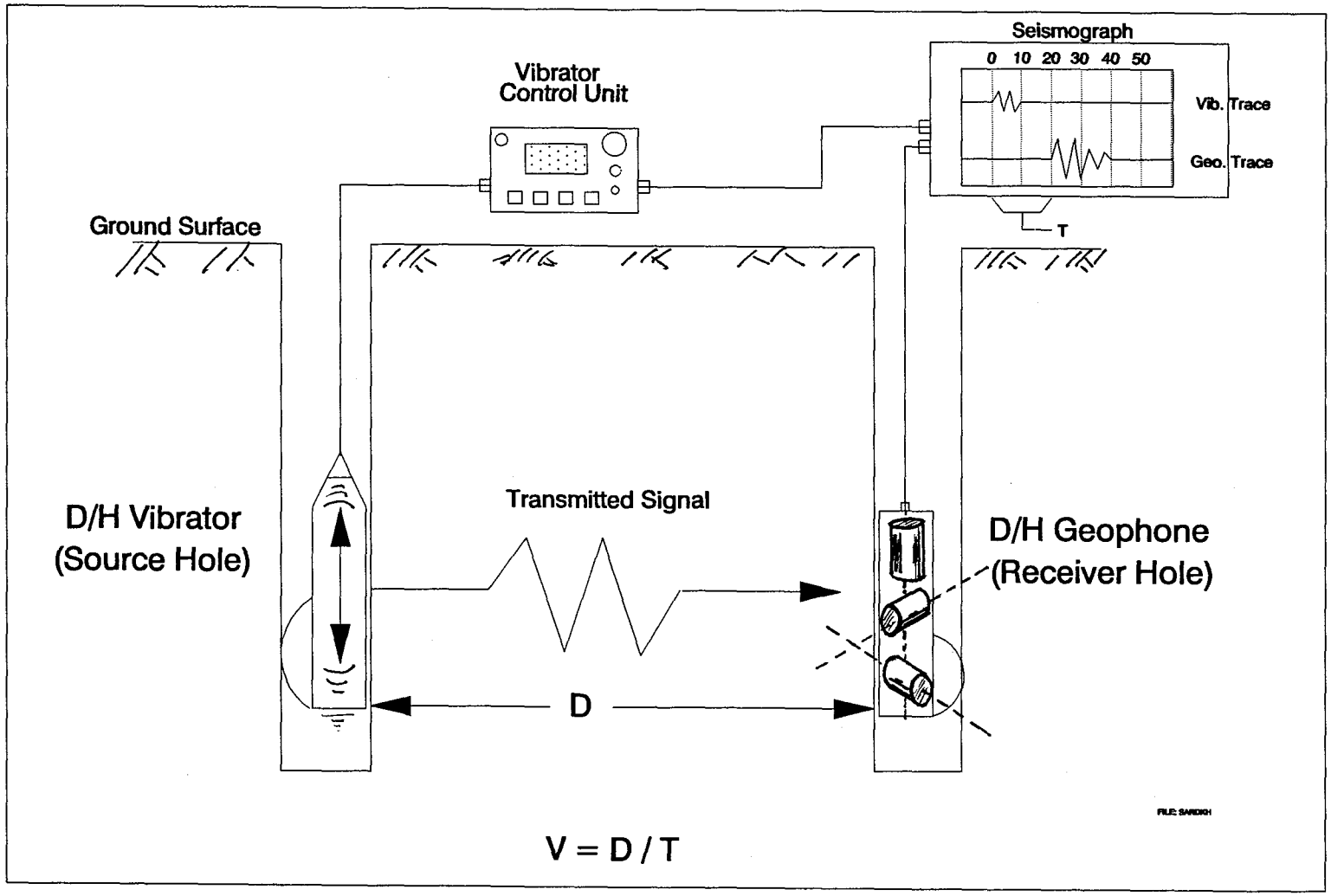


Figure 4. Crosshole S-wave testing setup

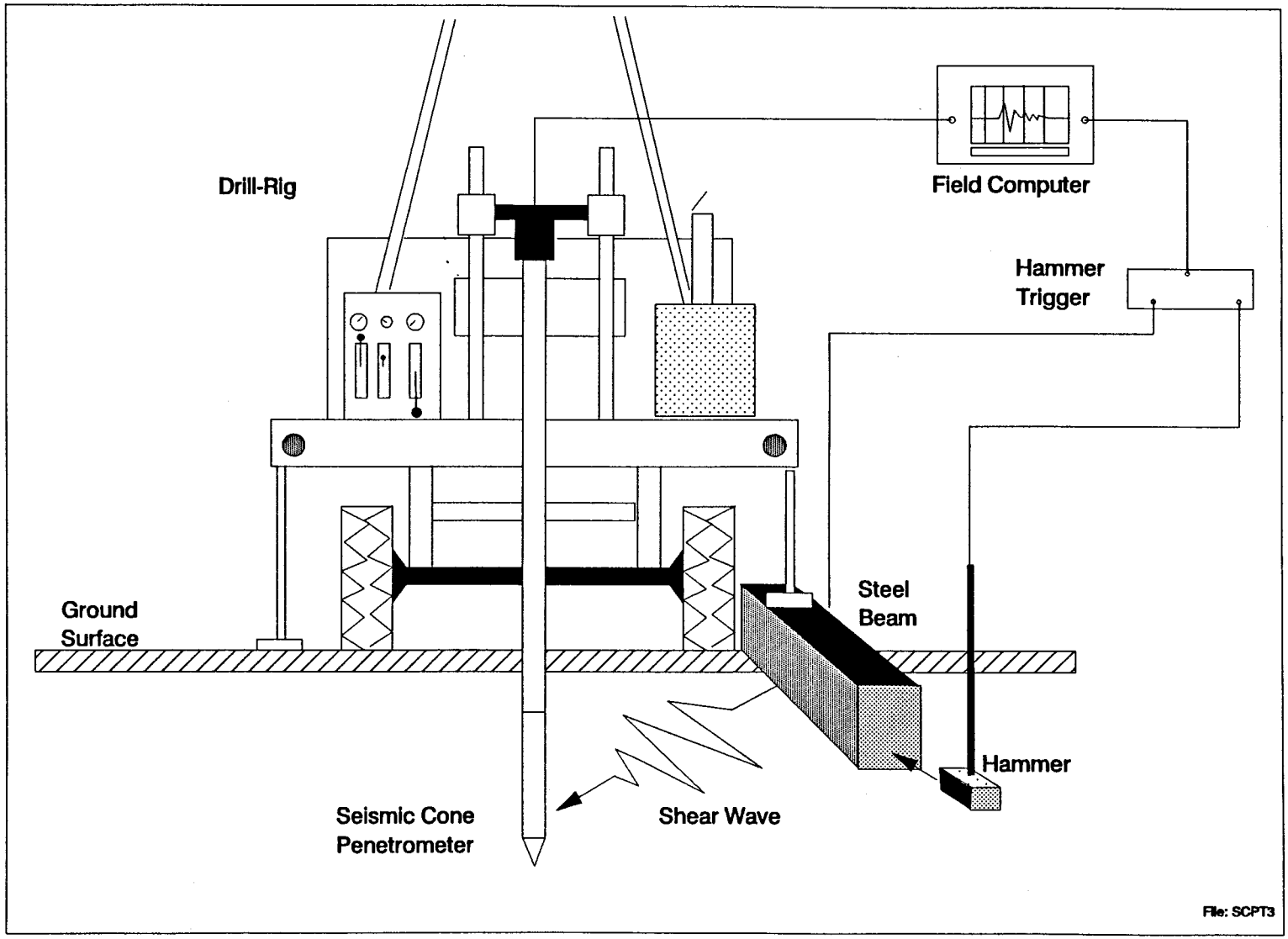


Figure 5. SCPT S-wave setup

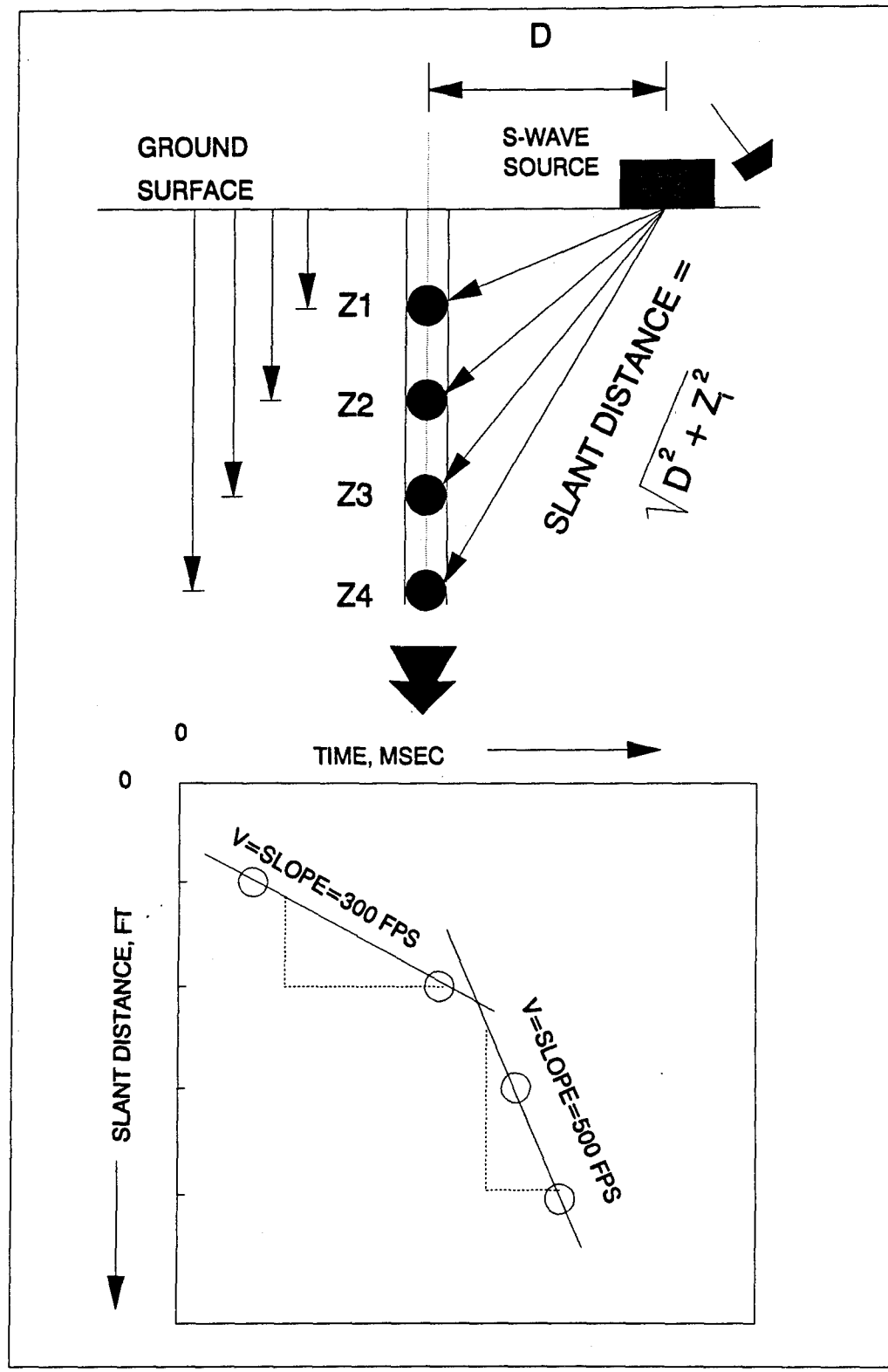


Figure 6. SCPT S-wave velocity determination

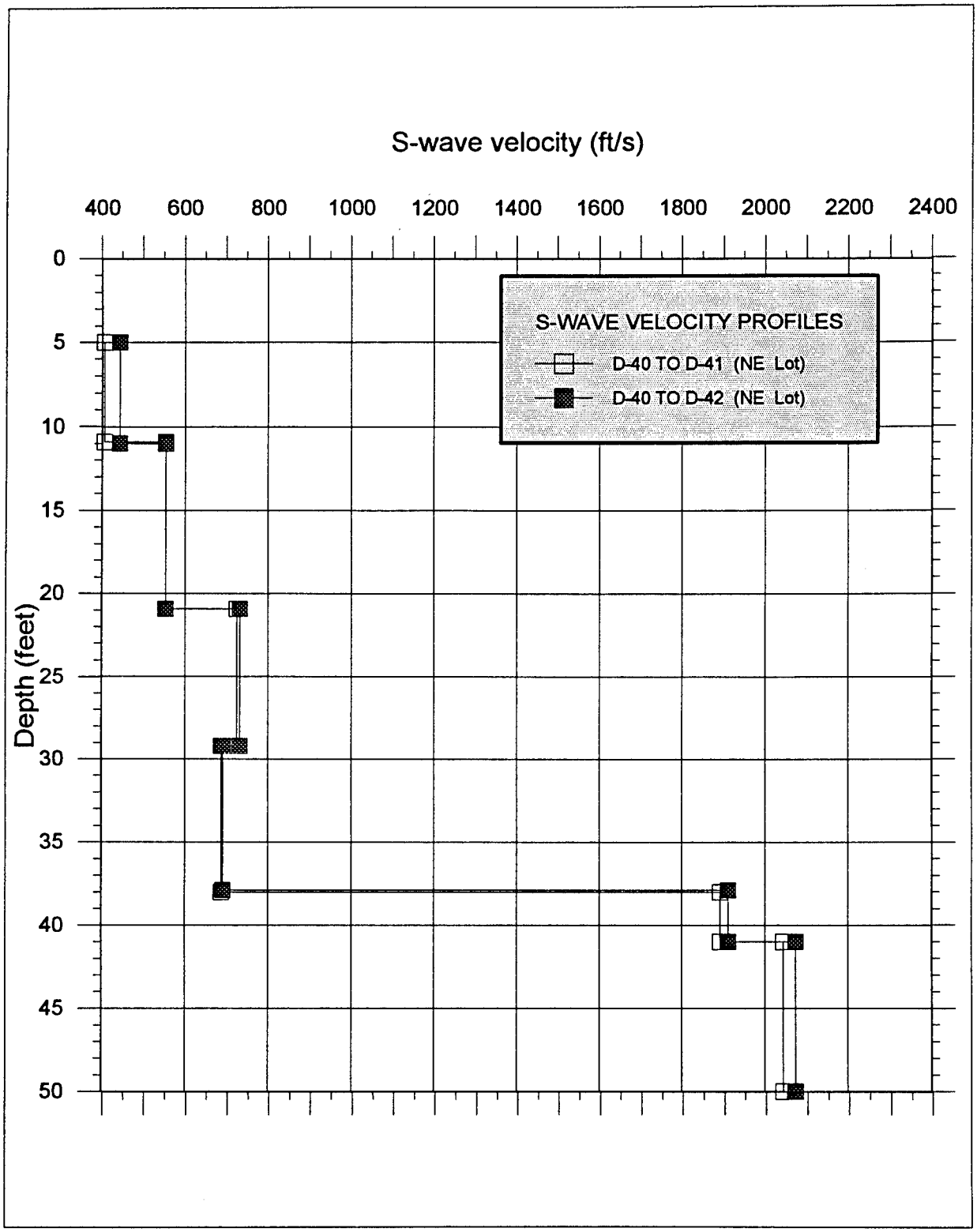


Figure 7. Crosshole S-wave results, northeast parking lot

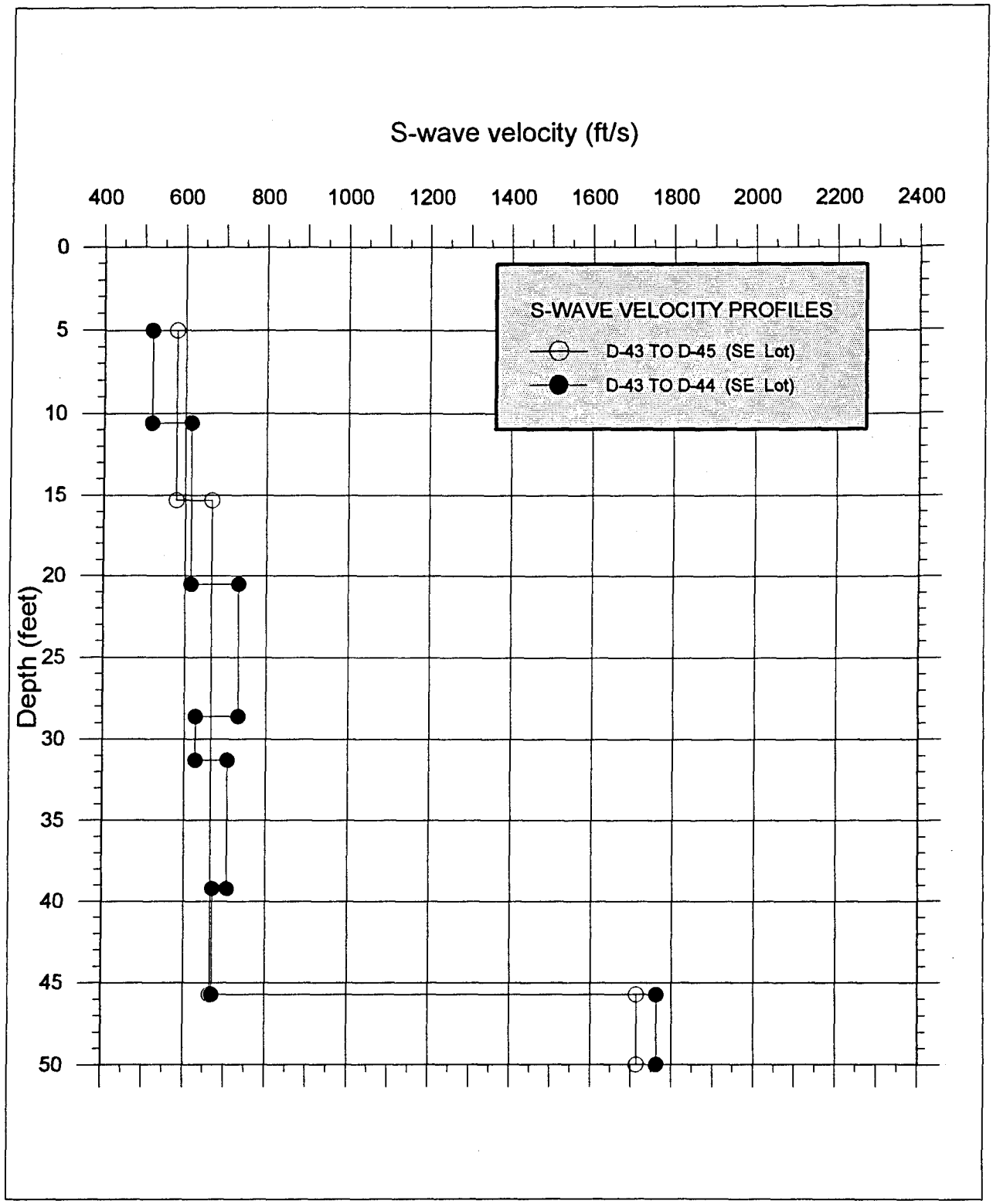


Figure 8. Crosshole S-wave results, southeast parking lot

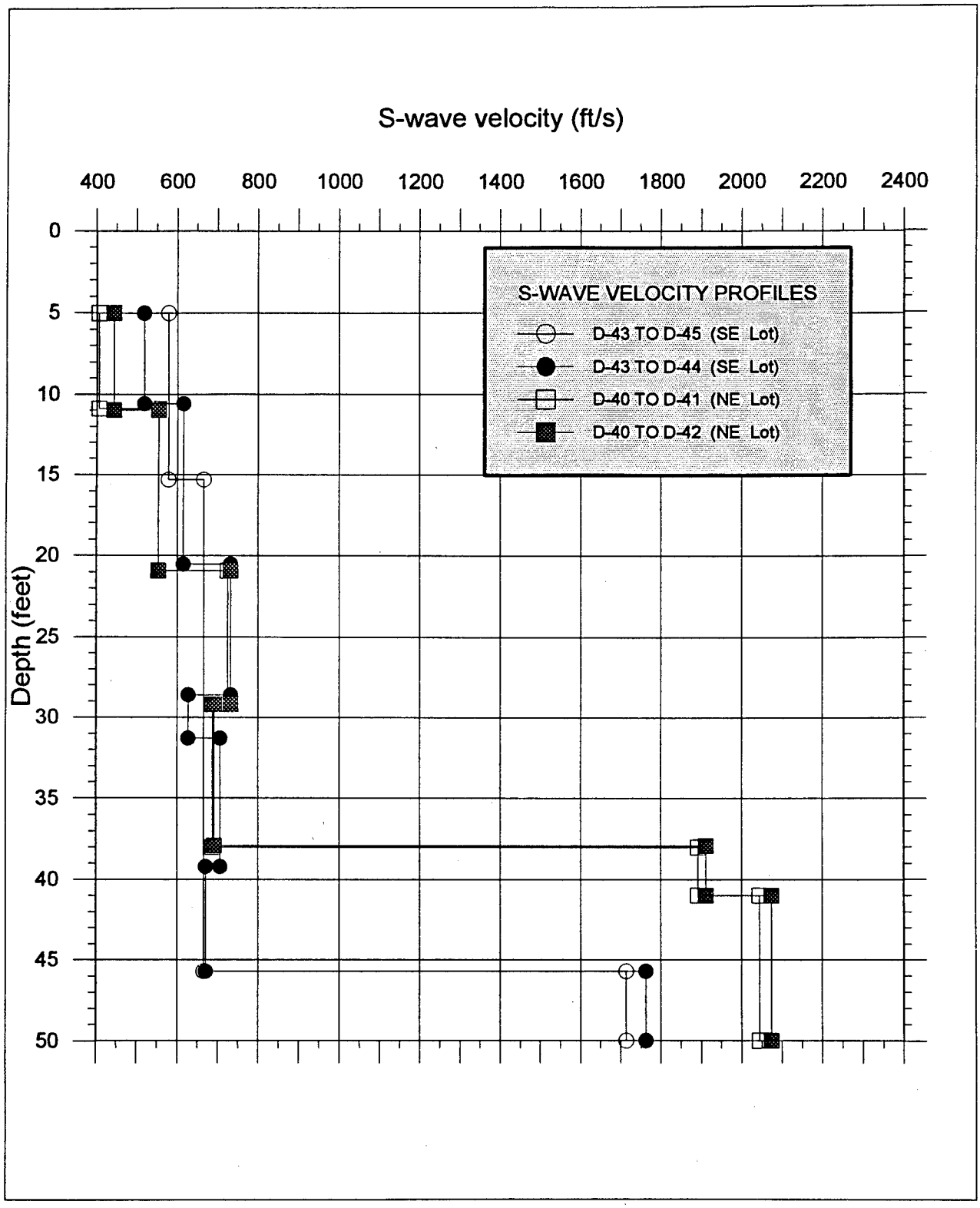


Figure 9. Superimposed crosshole S-wave results

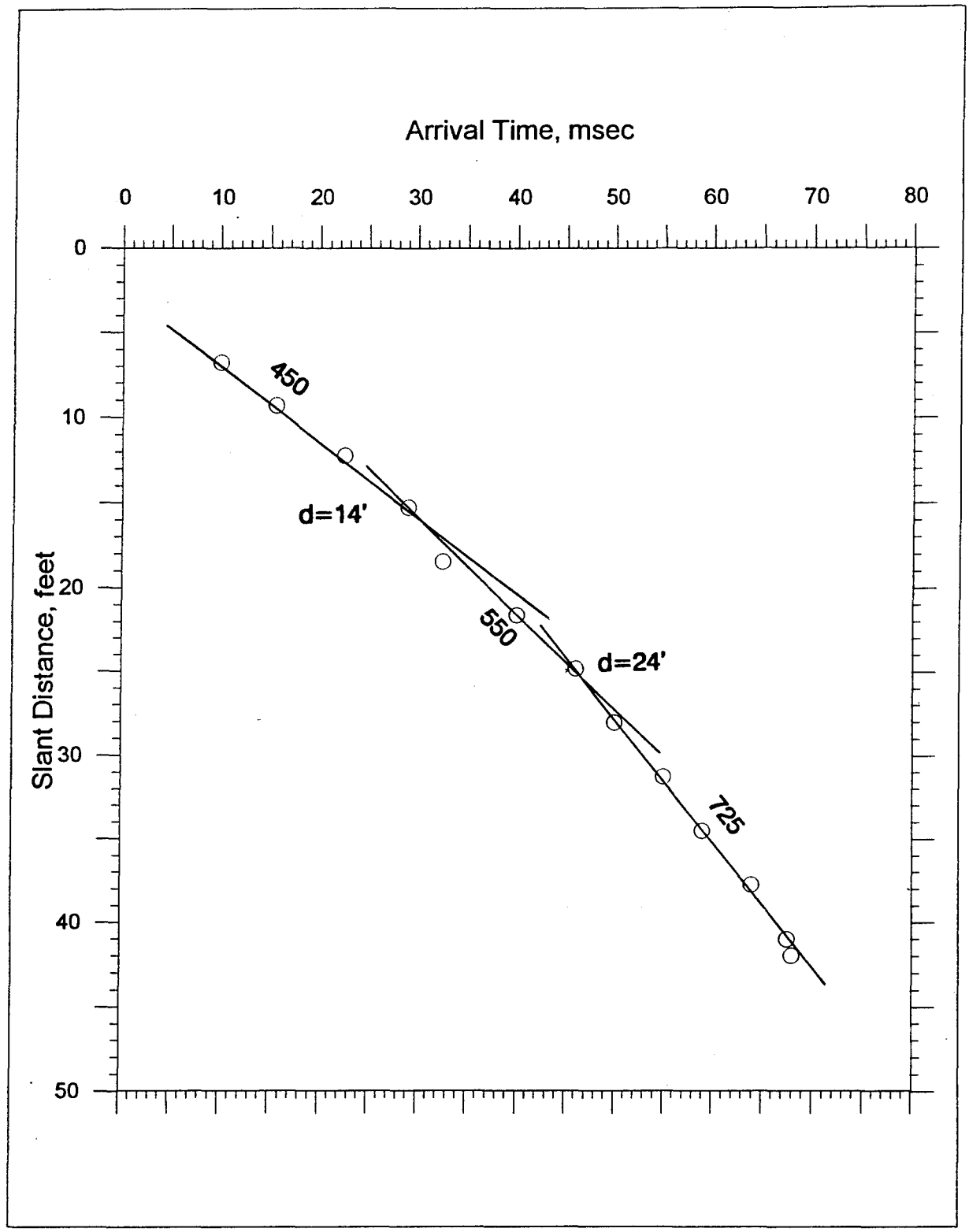


Figure 10. SCPT P-1 S-wave results

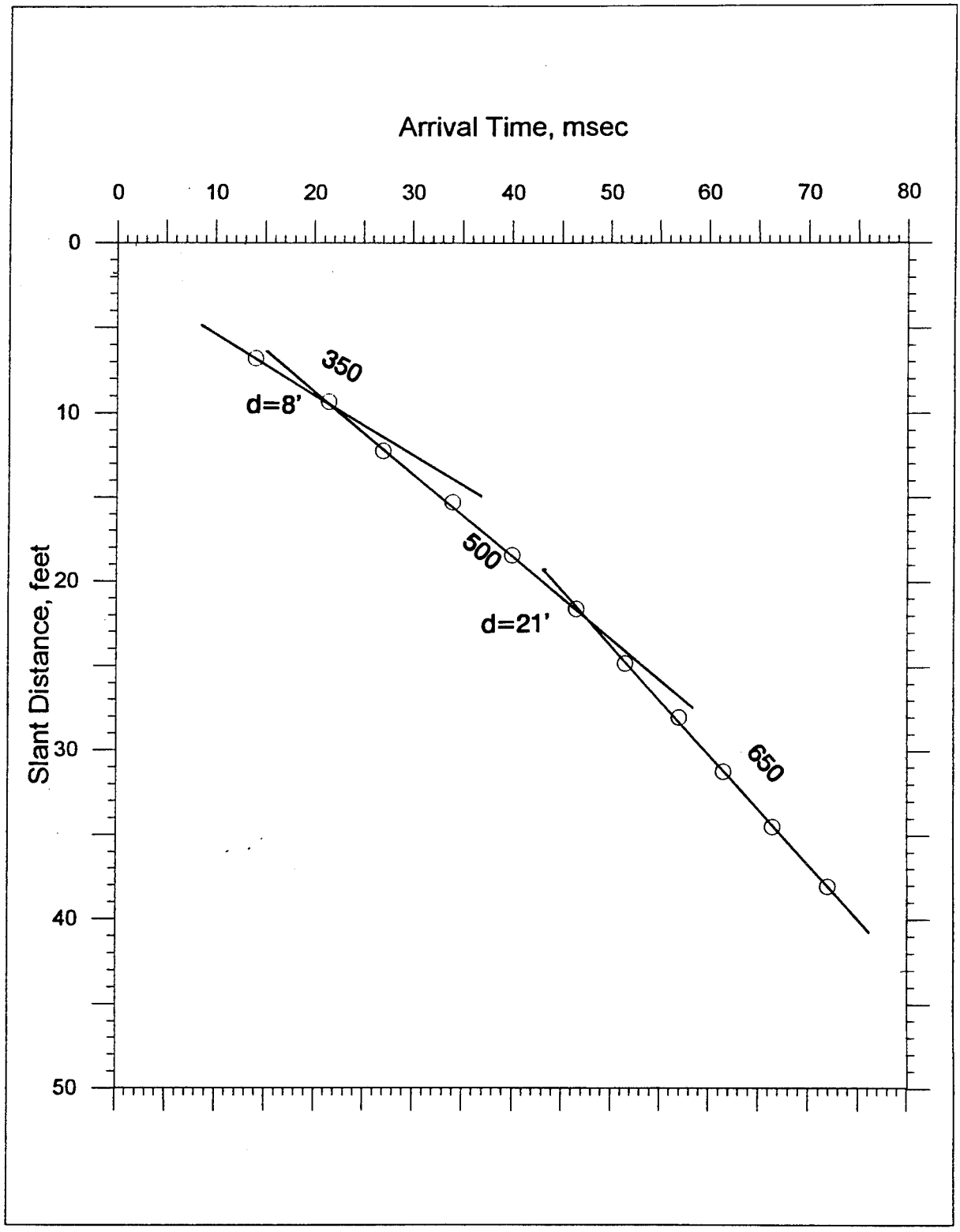


Figure 11. SCPT P-2 S-wave results

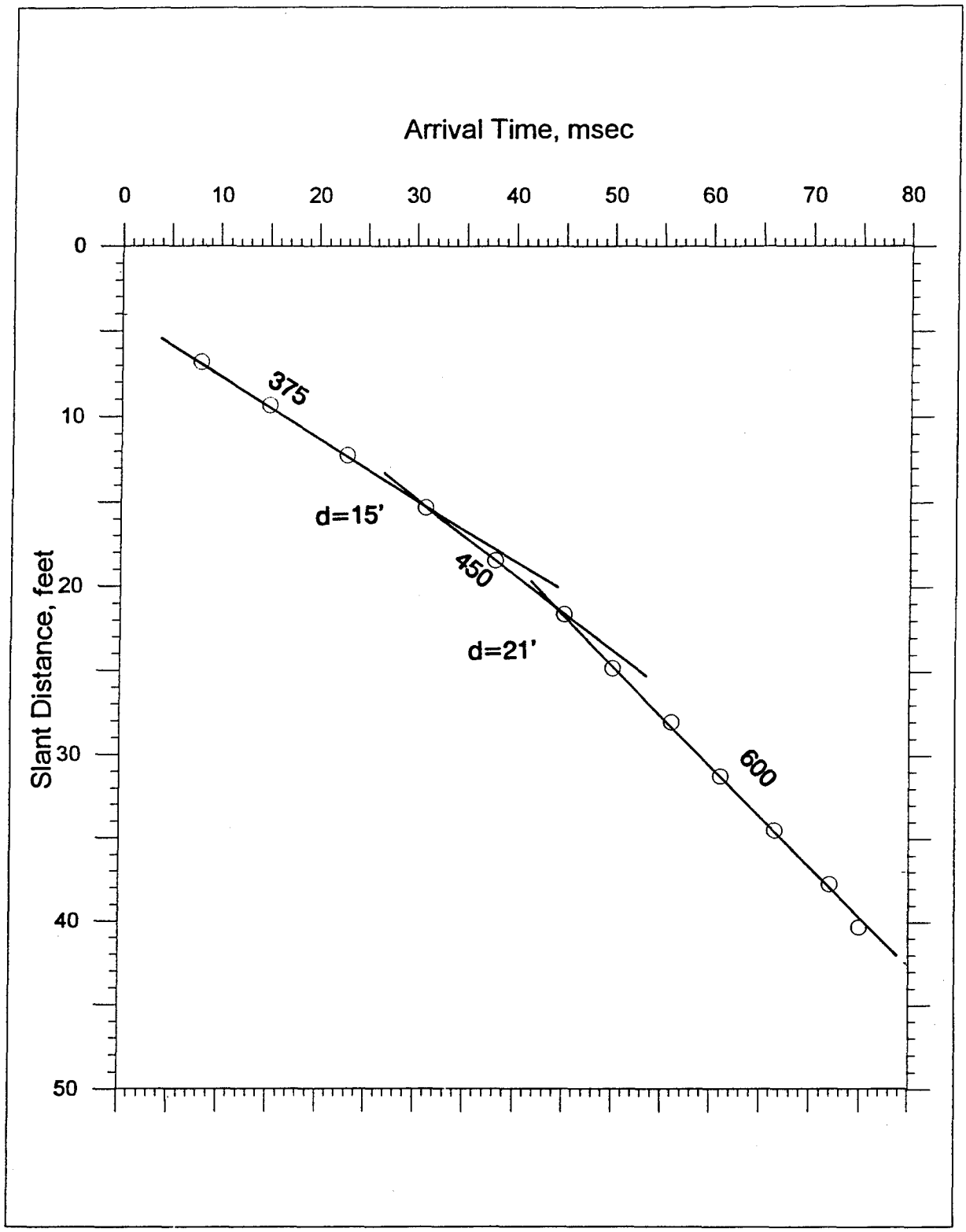


Figure 12. SCPT P-3 S-wave results

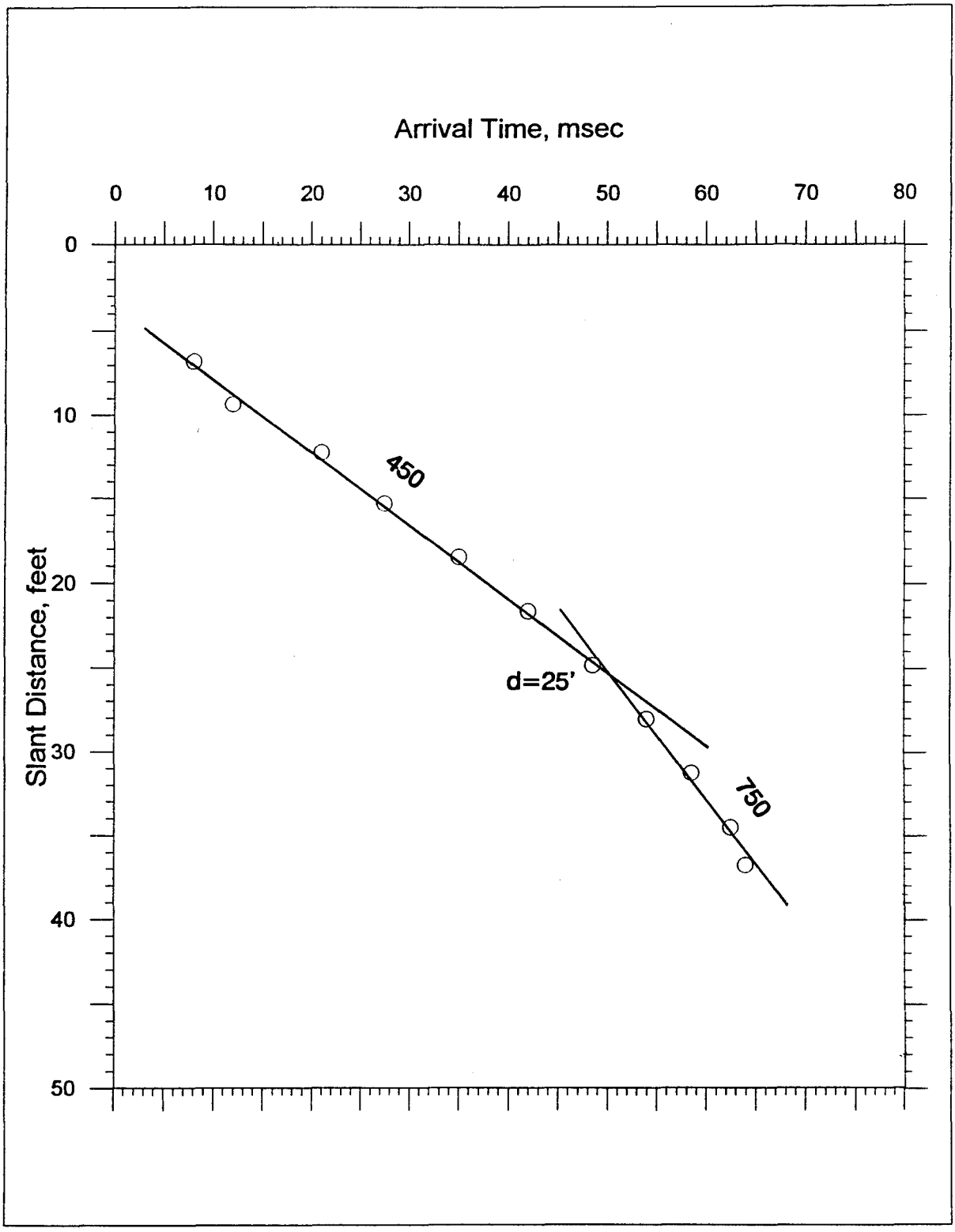


Figure 13. SCPT P-4 S-wave results

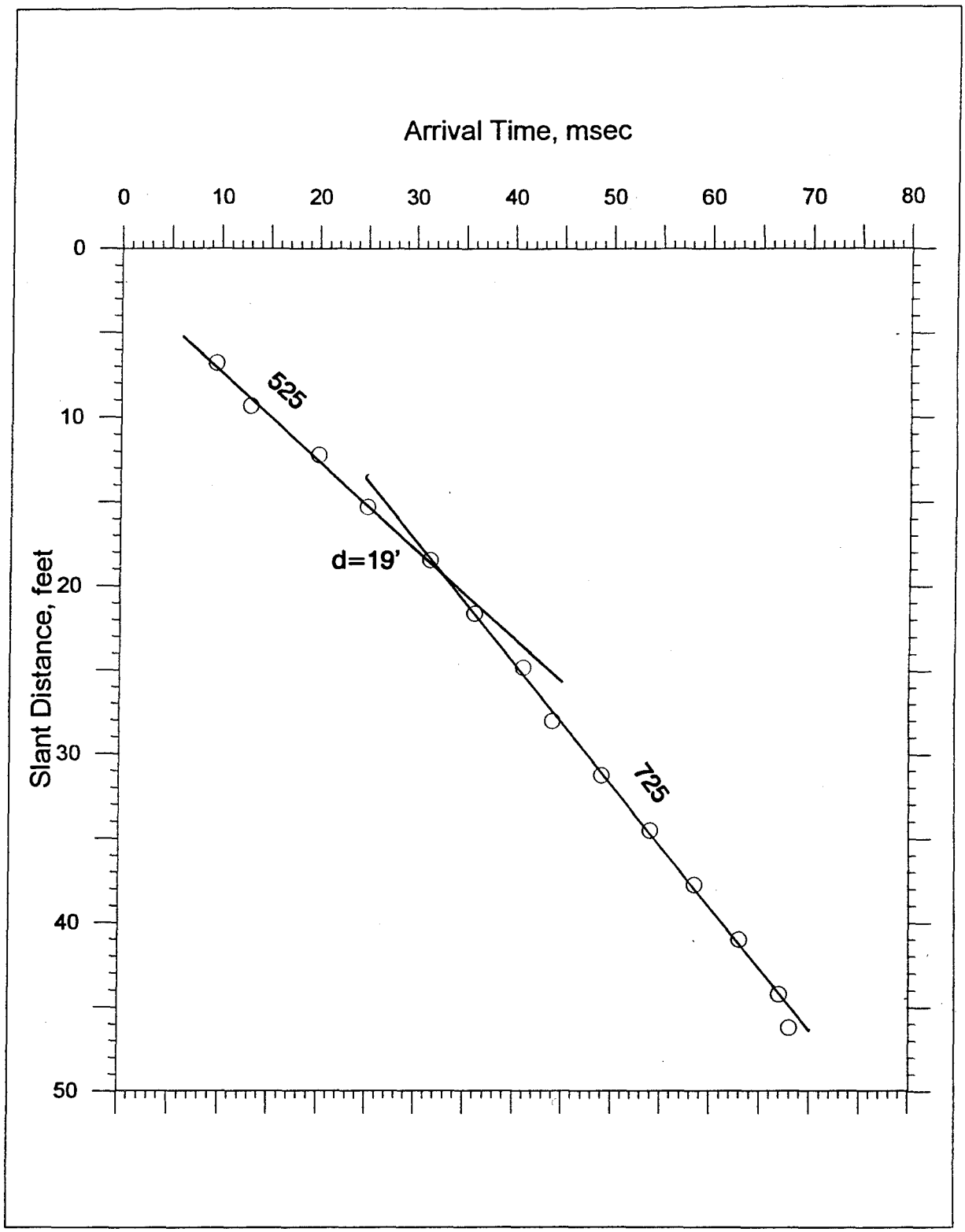


Figure 14. SCPT P-5 S-wave results

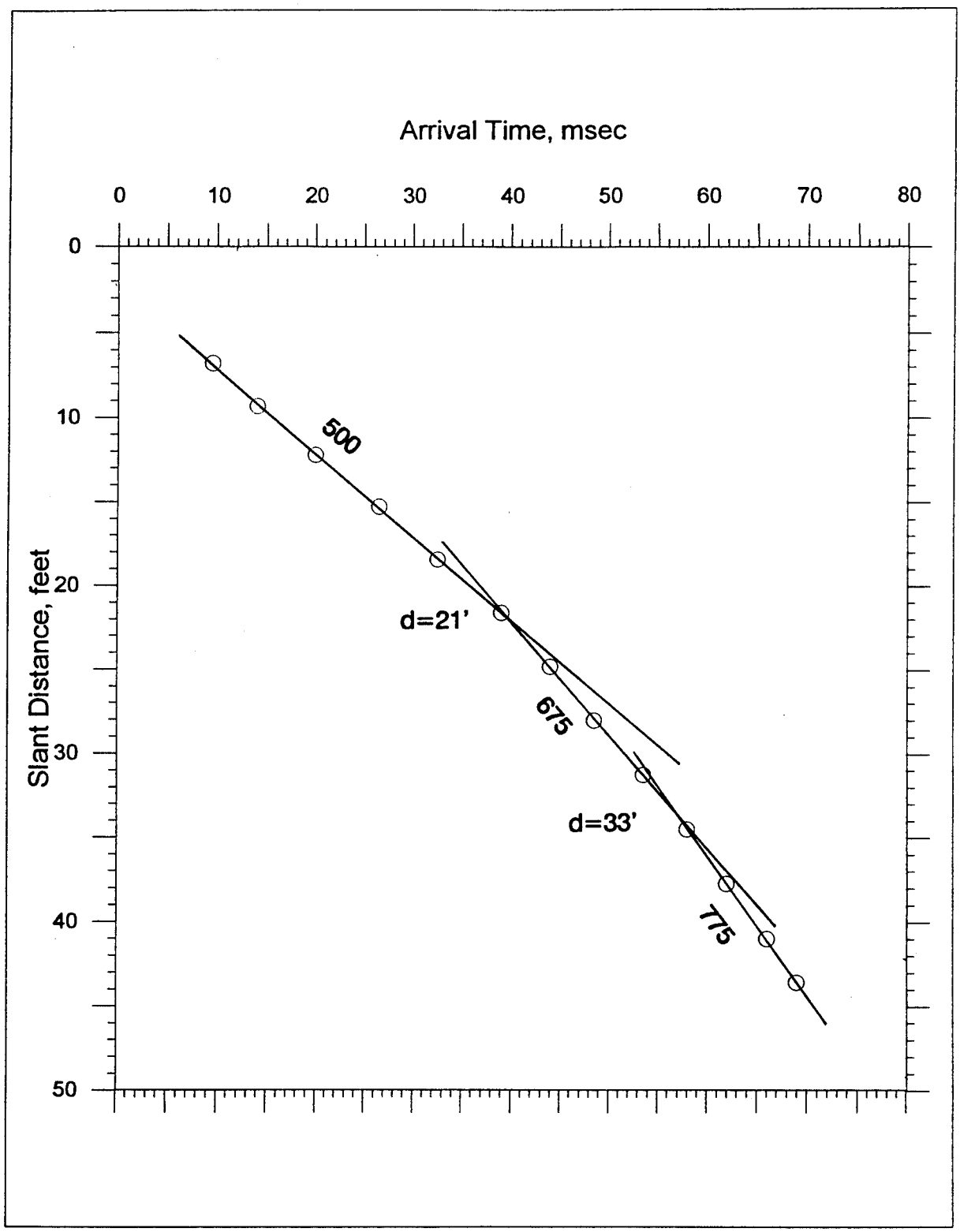


Figure 15. SCPT P-6 S-wave results

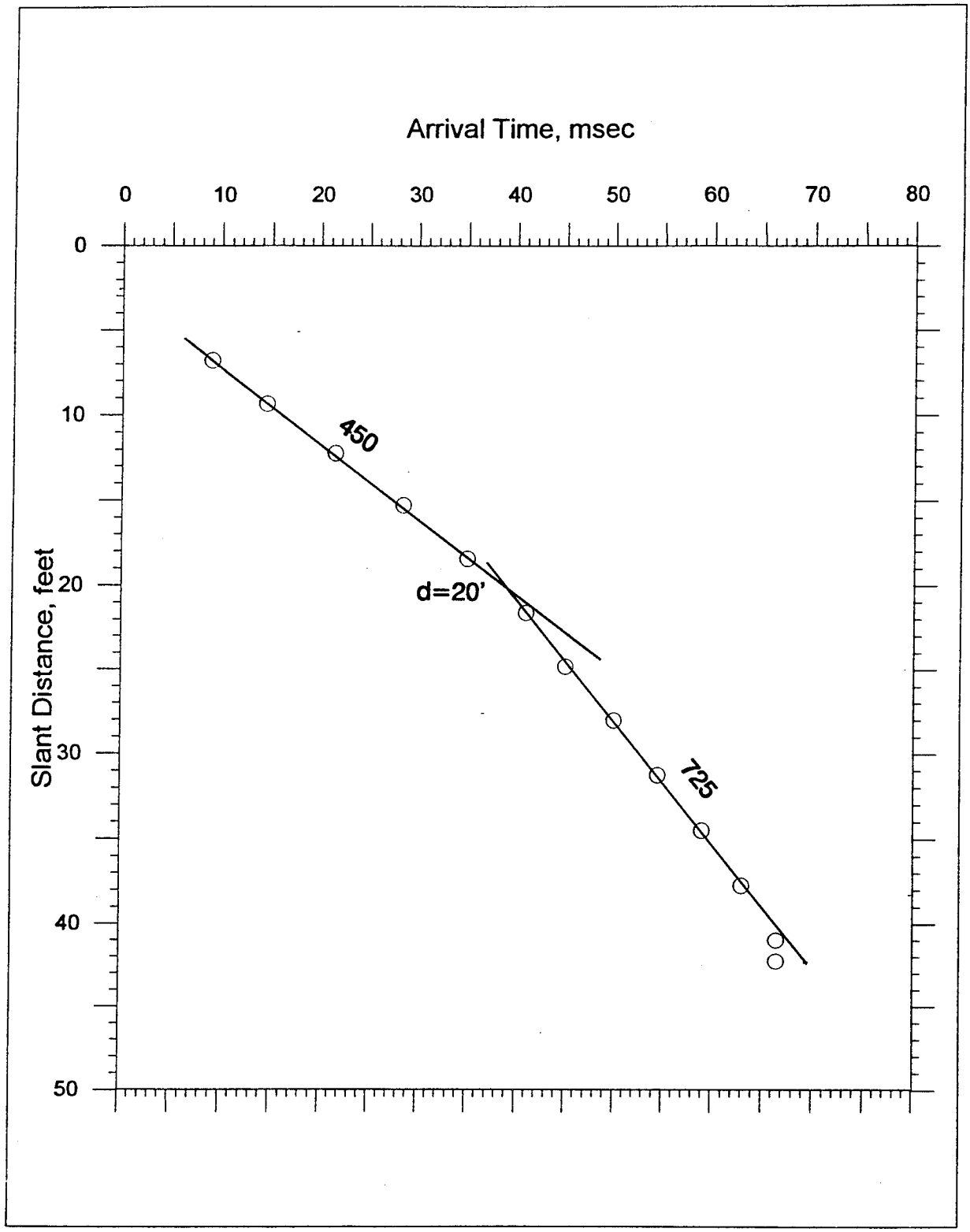


Figure 16. SCPT P-7 S-wave results

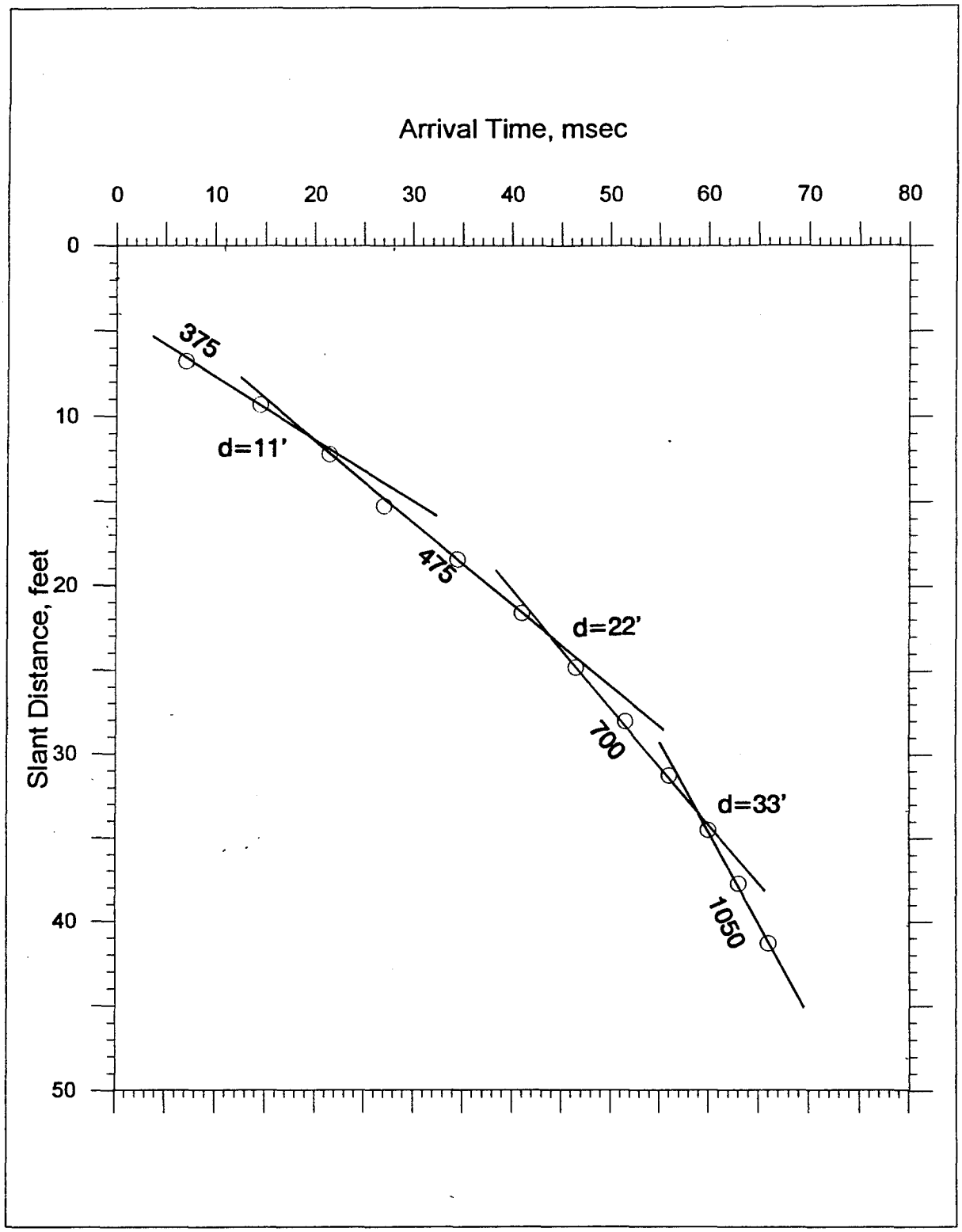


Figure 17. SCPT P-8 S-wave results

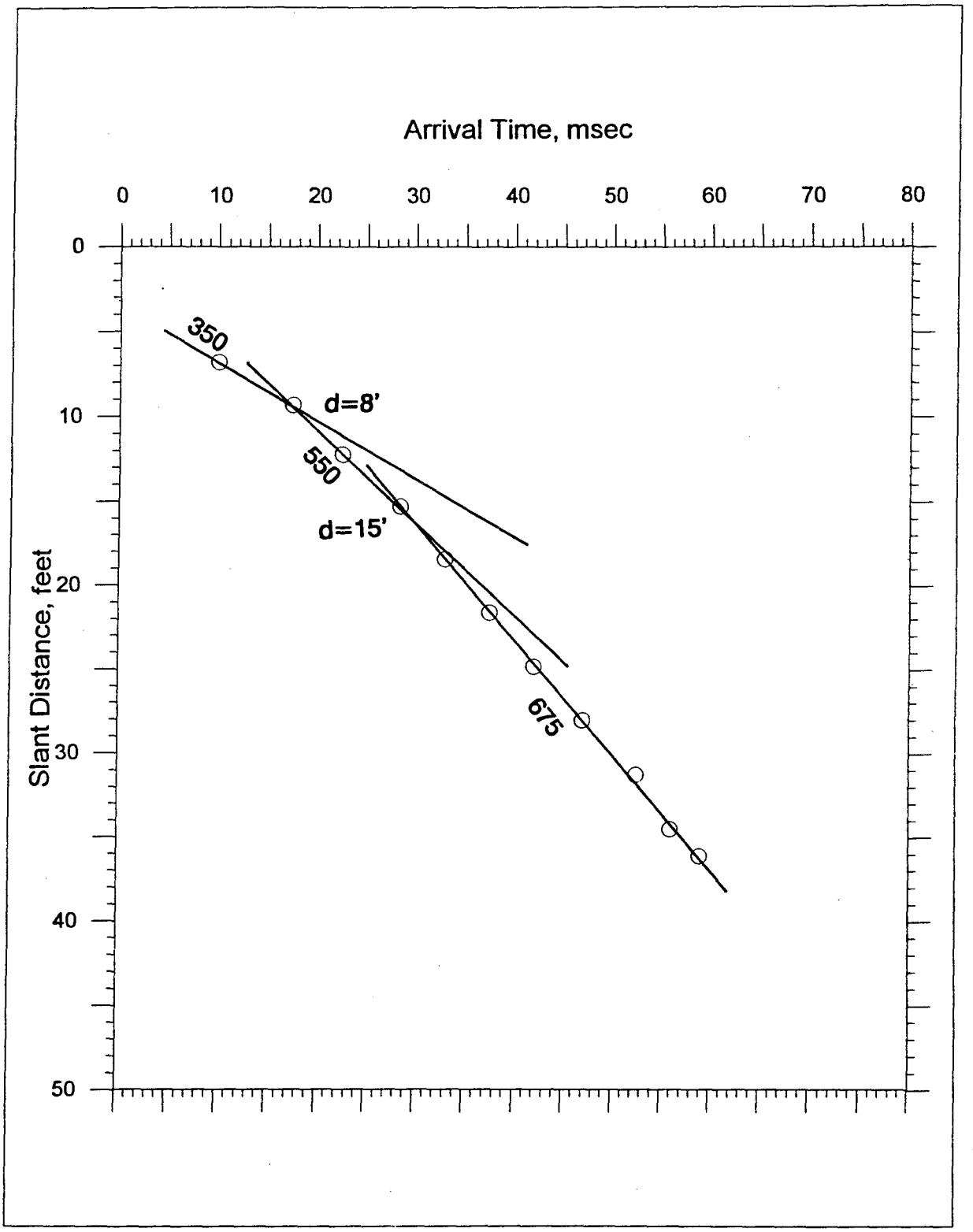


Figure 18. SCPT P-9 S-wave results

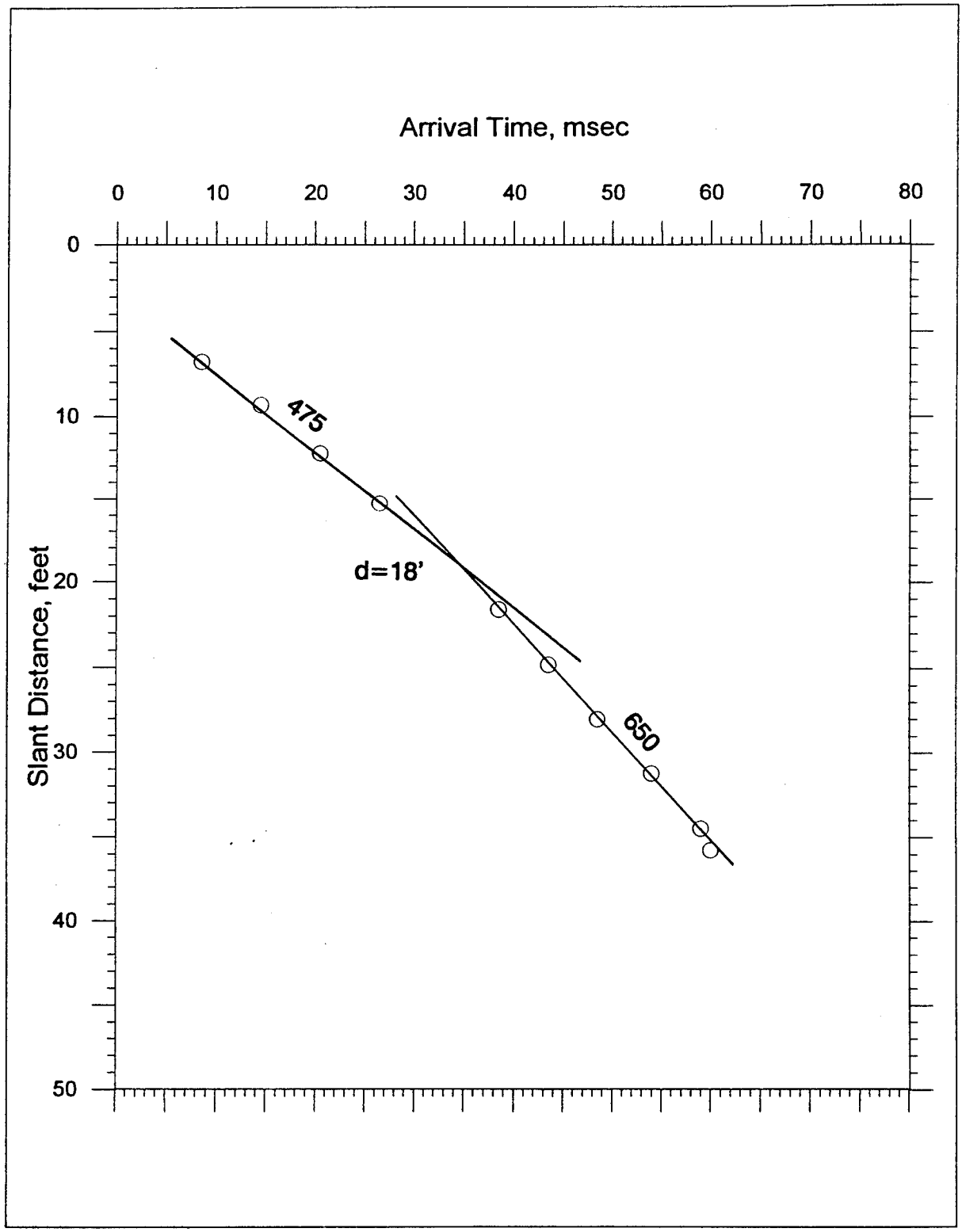


Figure 19. SCPT P-10 S-wave results

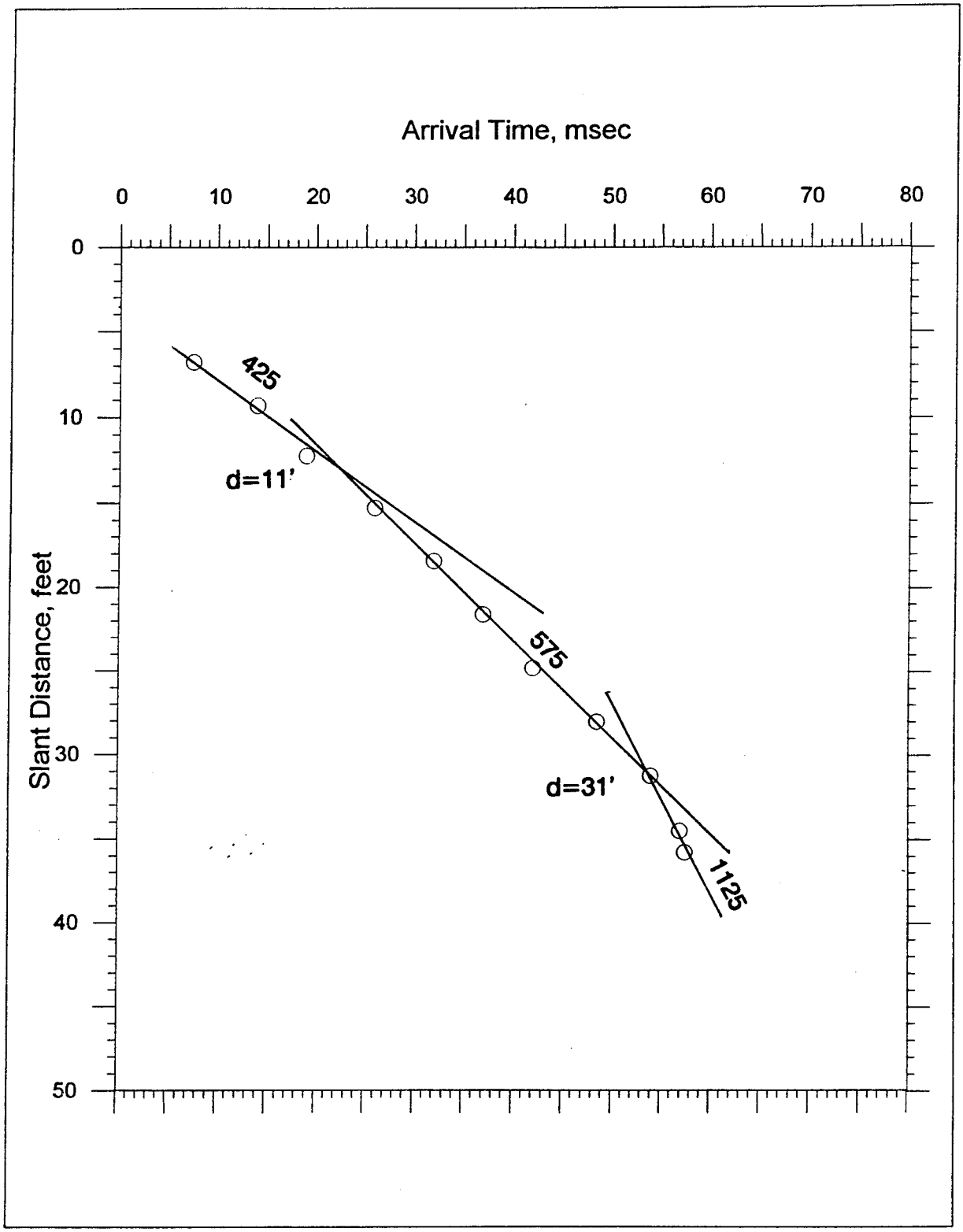


Figure 20. SCPT P-11 S-wave results

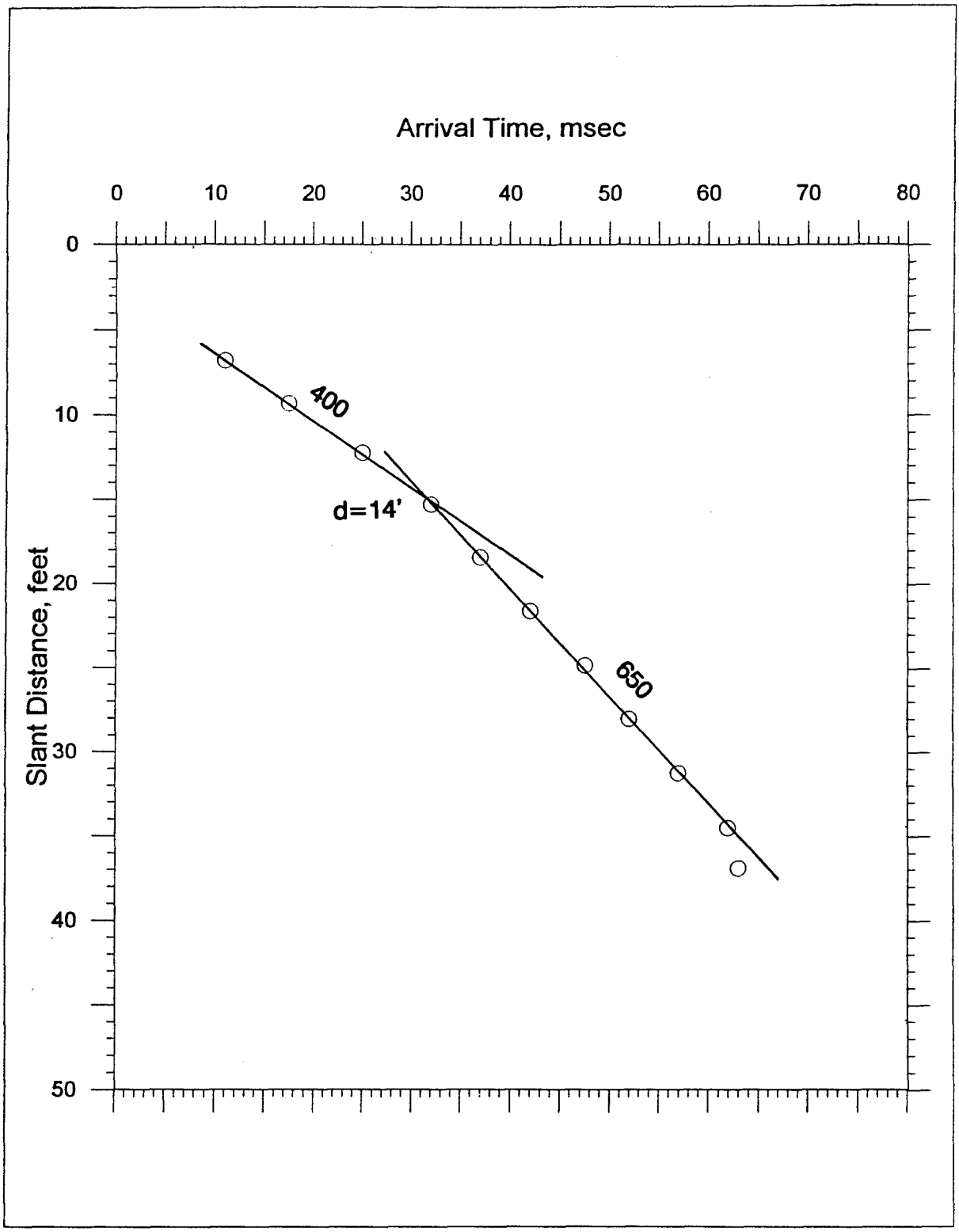


Figure 21. SCPT P-12 S-wave results

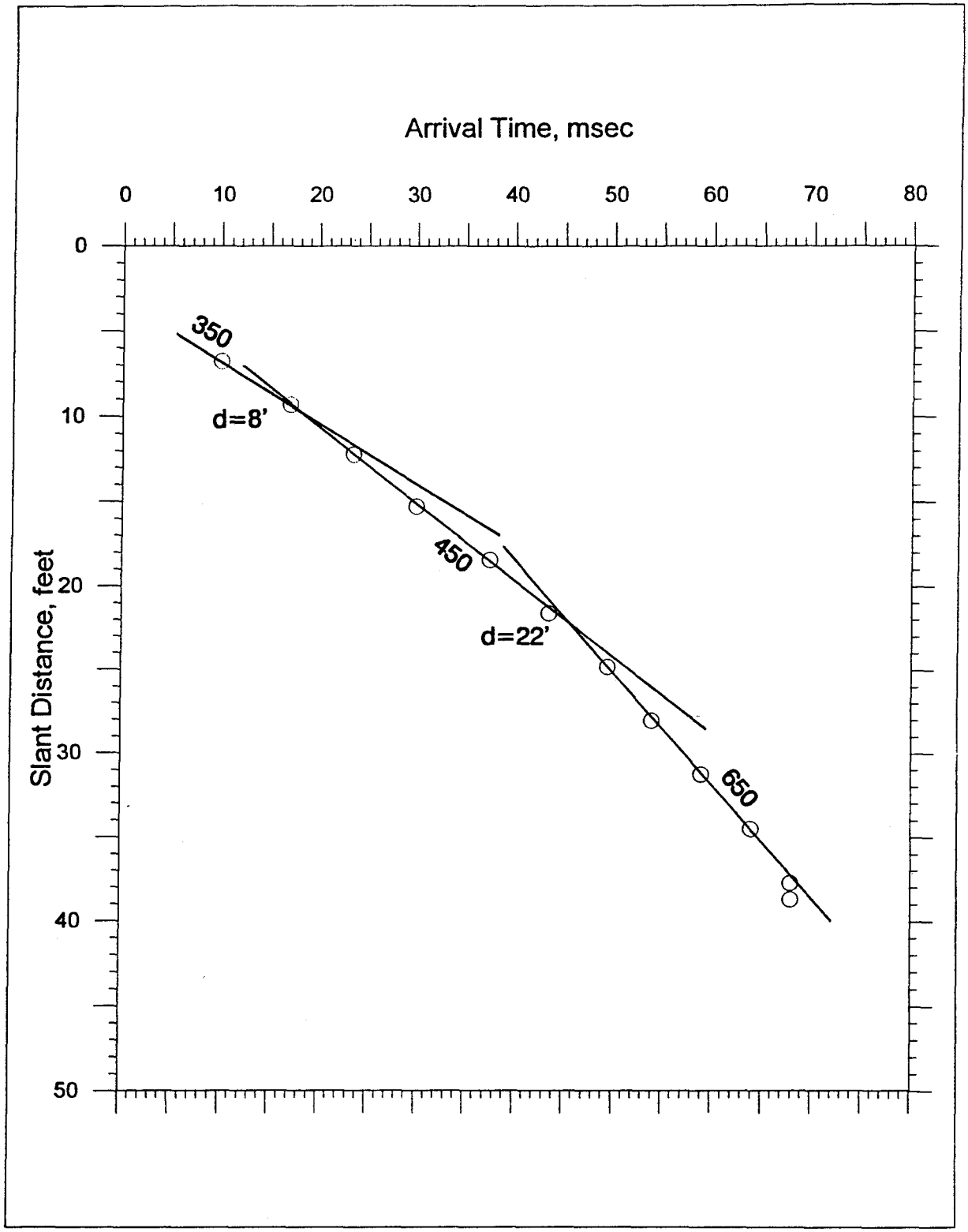


Figure 22. SCPT P-13 S-wave results

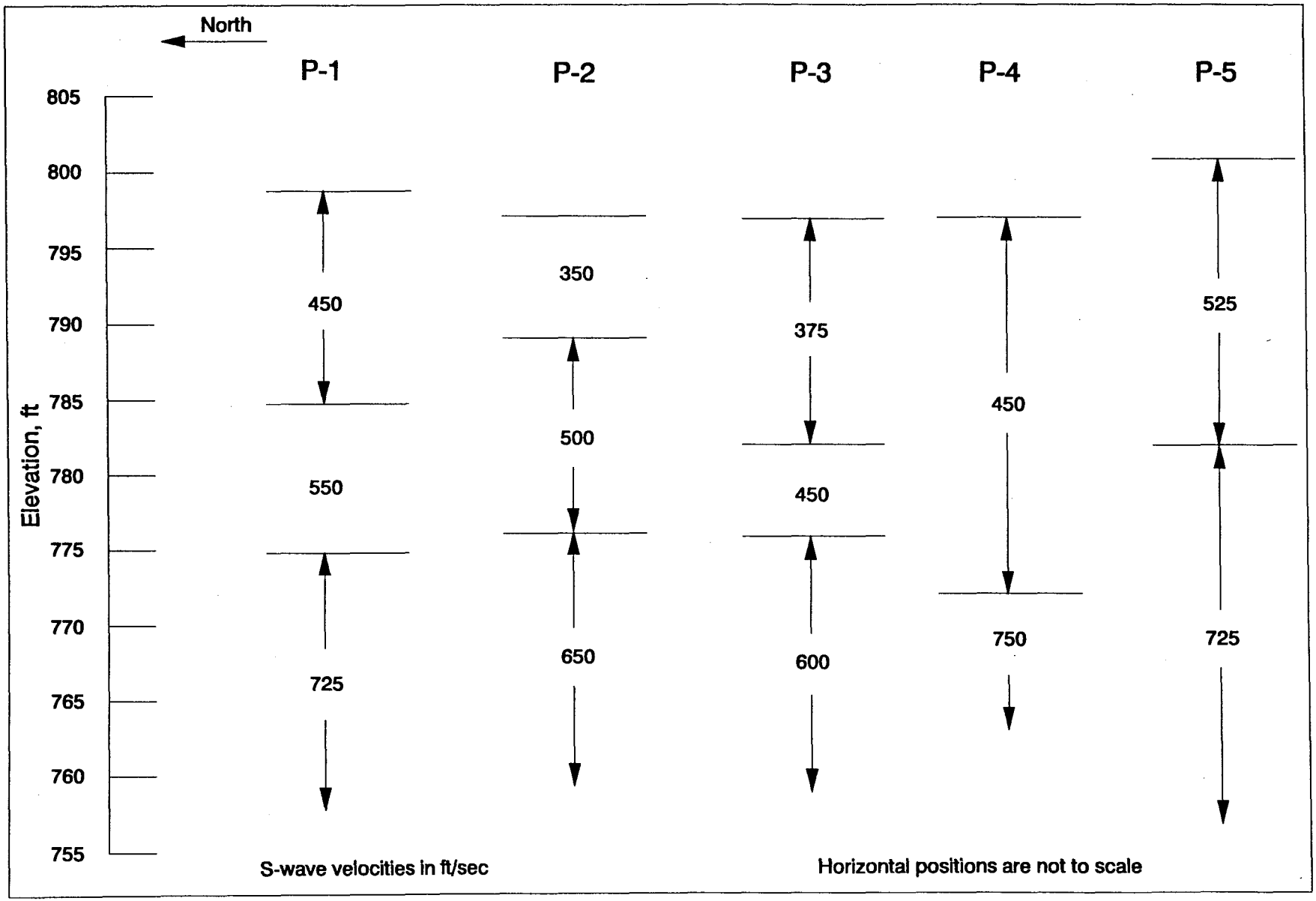


Figure 23. SCPT S-wave results, east side of main building

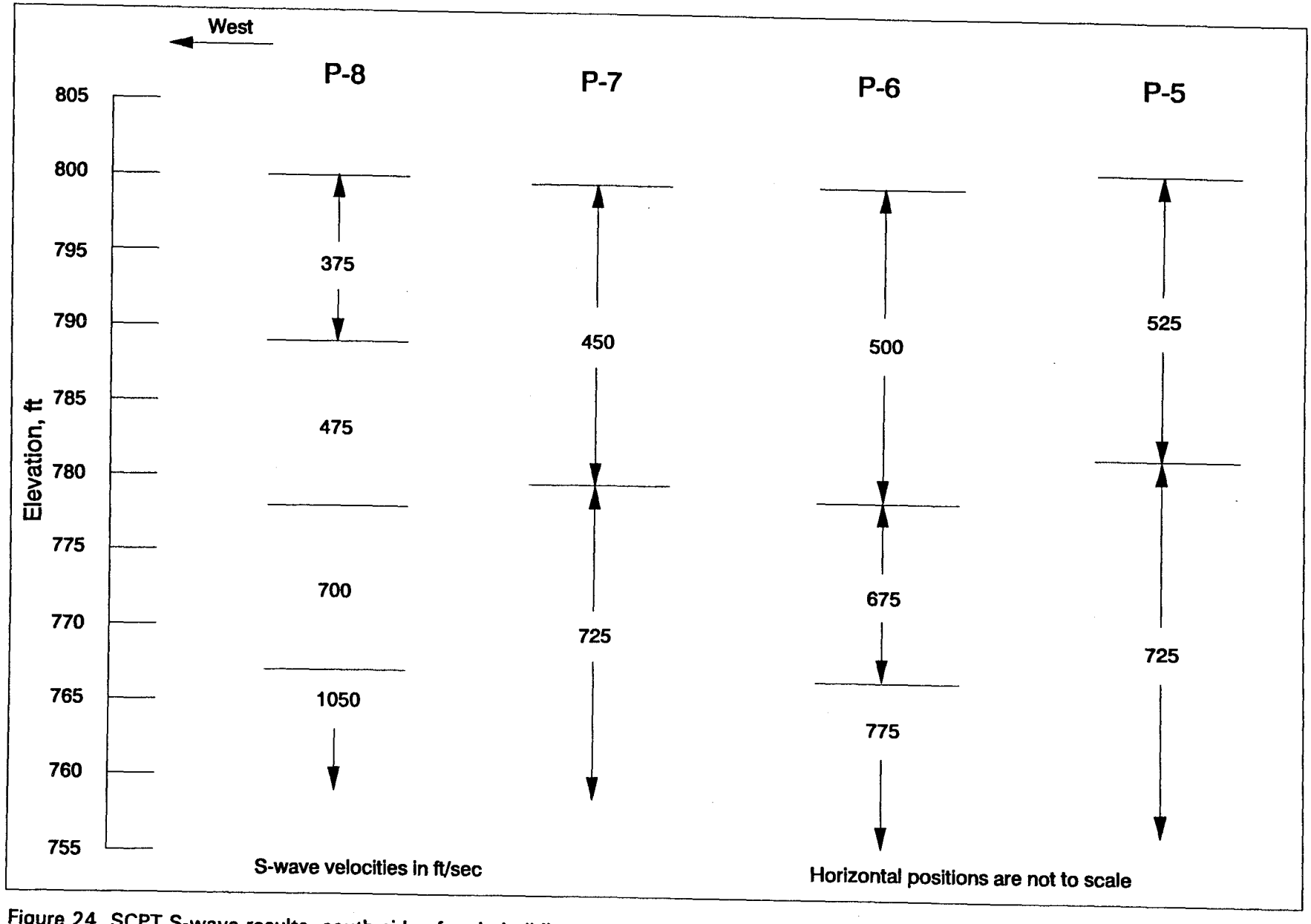


Figure 24. SCPT S-wave results, south side of main building

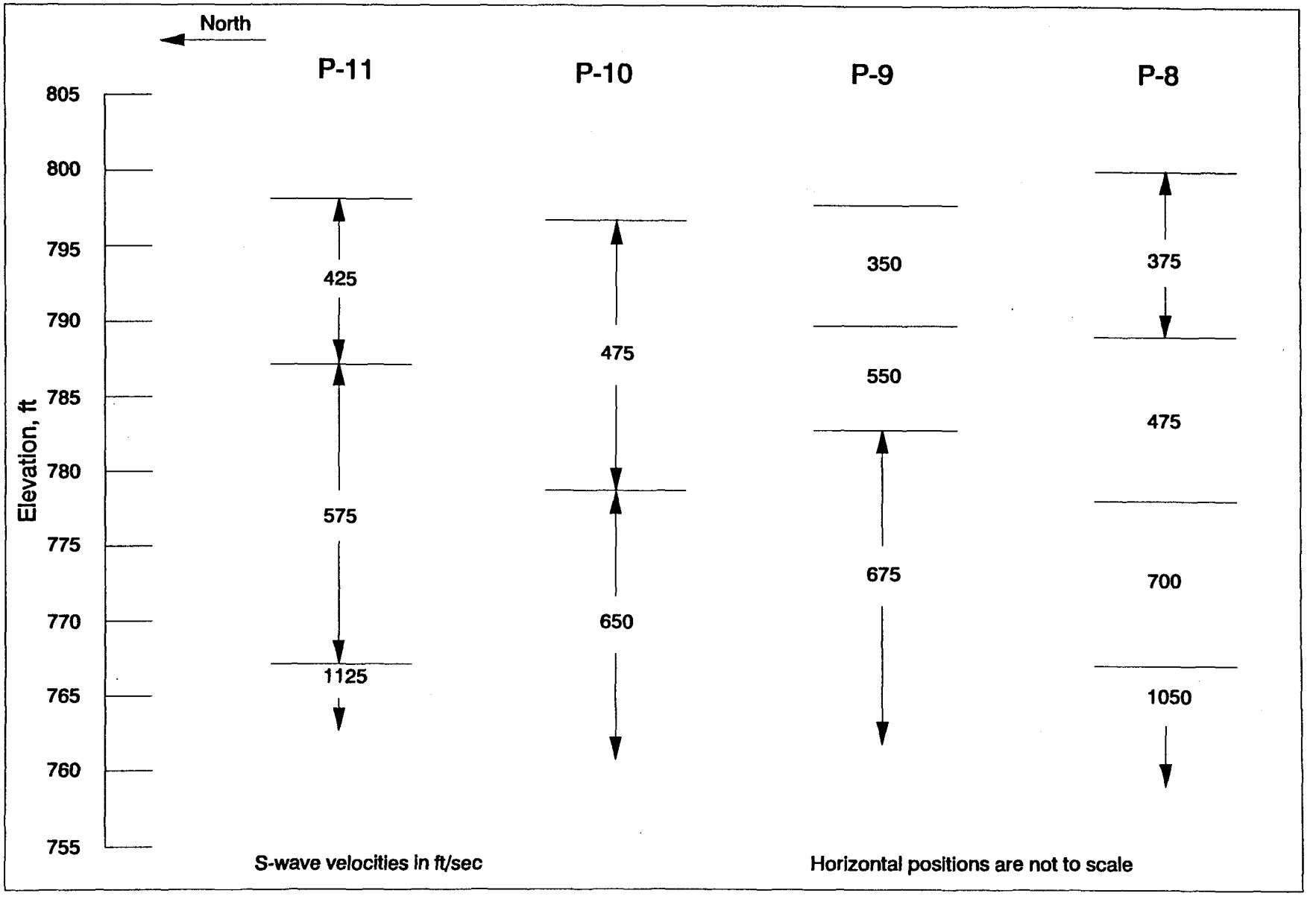


Figure 25. SCPT S-wave results, west side of main building

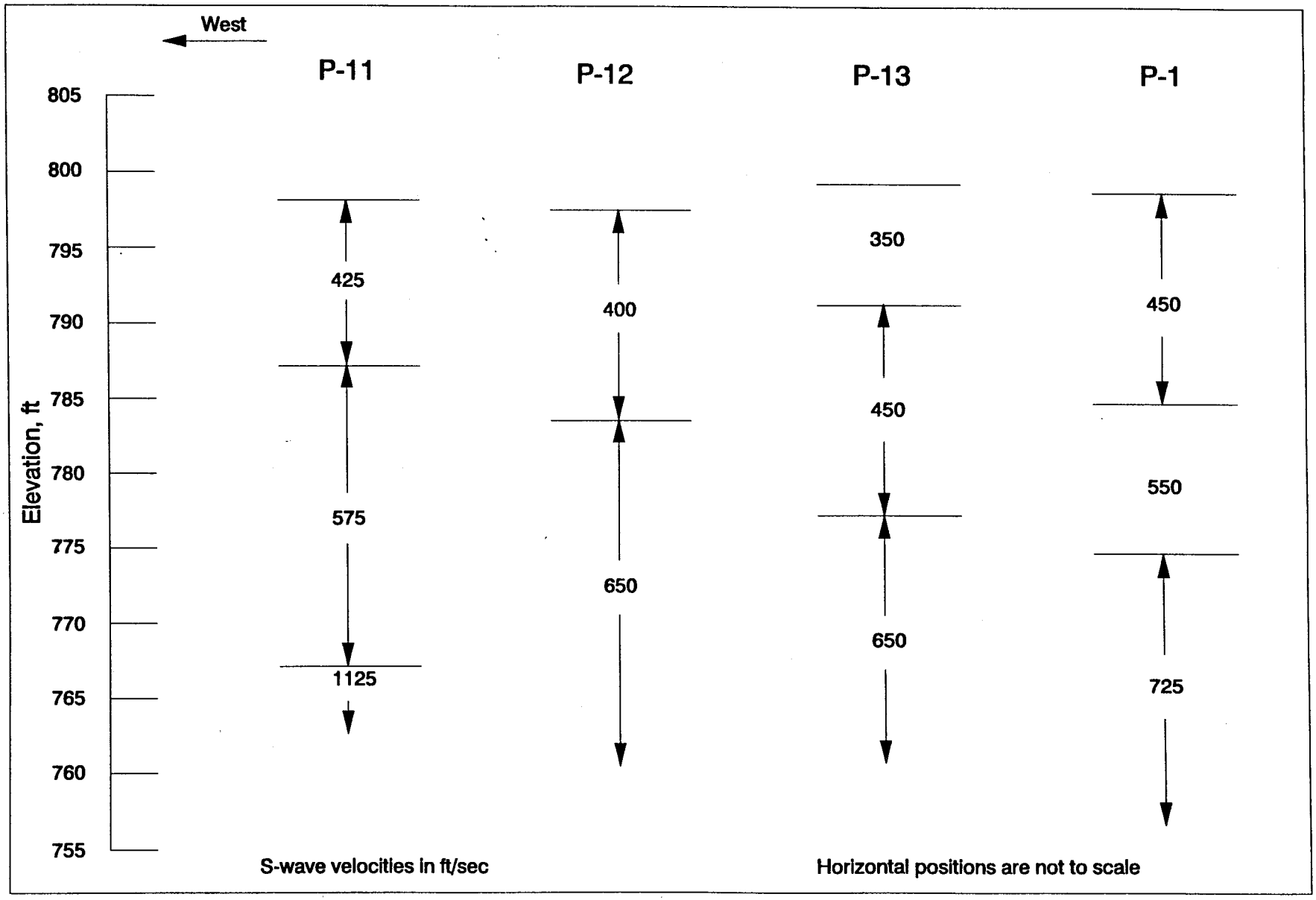


Figure 26. SCPT S-wave results, north side of main building

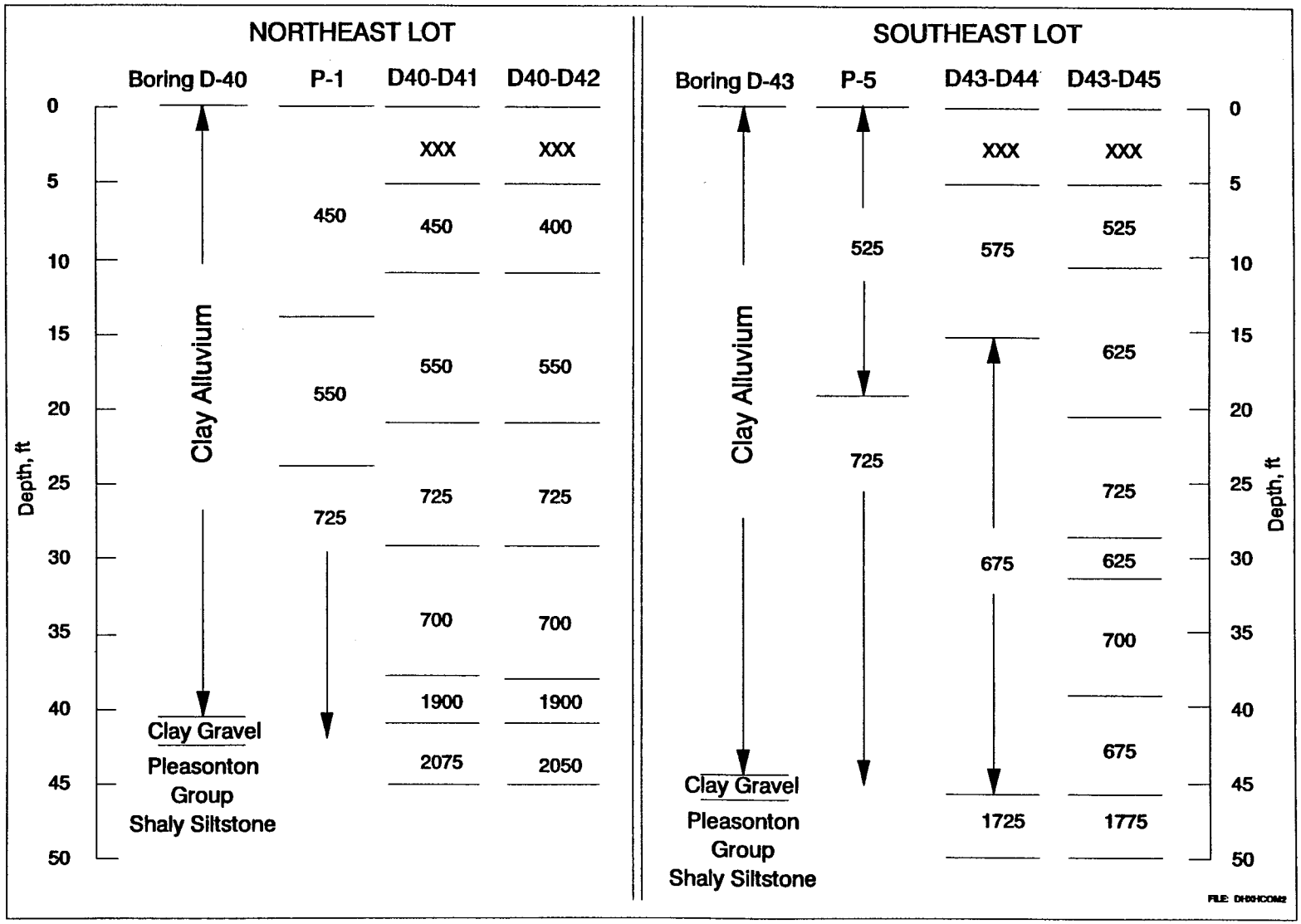


Figure 27. Crosshole and SCPT S-wave velocity profile comparisons

Appendix A
Survey Results

S-wave Crosshole Borings and SCPT Push Coordinates and Elevations			
Northing	**Easting**	**Elevation, ft**	**Description**
1017812.34	2769663.61	798.74	Boring D-41
1017802.89	2769666.03	798.79	Boring D-40
1017792.91	2769667.71	798.84	Boring D-42
1017806.83	2769661.52	798.69	SCPT 1
1017184.82	2769385.27	797.09	SCPT 2
1016673.20	2769489.31	796.89	SCPT 3
1016207.41	2769567.16	796.82	SCPT 4
1015560.94	2769876.10	800.64	Boring D-45
1015563.01	2769885.64	800.75	Boring D-43
1015565.58	2769895.69	800.85	Boring D-44
1015566.53	2769887.41	800.79	SCPT 5
1015710.58	2769177.31	799.59	SCPT 6
1015644.80	2768644.24	799.69	SCPT 7
1015472.91	2767847.79	799.98	SCPT 8
1015937.87	2767368.18	797.64	SCPT 9
1016386.73	2767271.46	796.62	SCPT 10
1016634.91	2767361.29	798.07	SCPT 11
1016834.36	2768356.42	797.59	SCPT 12
1017111.23	2768673.77	799.16	SCPT 13

Note: Northings and Eastings based on points #3 and #4 as shown on map by George Butler and Associates, DWG. #17810-V1 dated 2/1/93 and provided by Mr. Mark Drury, Allied-Signal Corporation. Elevations based on data stamped on brass caps.

Appendix B
Boring Logs

Boring D-41

Northeast Parking Lot

Hole No. NS-41

DRILLING LOG	DIVISION MRD	INSTALLATION KCO	SHEET 1 OF 7 SHEETS

1. PROJECT: Munister Federal Complex Seismic
2. LOCATION (Coordinates or Station): See Sketch
3. DRILLING AGENCY: Corp of Engineers
4. HOLE NO. (As shown on drawing title and file number): NS-41
5. NAME OF DRILLER: M. Cooney
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 43.3
8. DEPTH DRILLED INTO ROCK: 43-10.7
9. TOTAL DEPTH OF HOLE: 54.0
10. SIZE AND TYPE OF BIT: 9" Hollow Stem Augers / 6 1/4" Rock Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED —0— UNDISTURBED —0—
14. TOTAL NUMBER CORE BOXES: —0—
15. ELEVATION GROUND WATER: Not detectable
16. DATE HOLE: STARTED 5-26-94 COMPLETED 5-27-94
17. ELEVATION TOP OF HOLE: NA
18. TOTAL CORE RECOVERY FOR BORING — %
19. SIGNATURE OF INSPECTOR: C. Kimmitt

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			ASPHALT 0.3'			9" Hollow Stem Augers Log from cuttings Place 2.6' 8" SCH 40 PVC Surface Casing fill anulus w/Betonite and cold-patch asphalt
	1		CRUSHED STONE (roadbase) Limestone (2" max. Dia.) Top of Natural Ground 1.1'			
			SILTY LEAN CLAY STIFF MOIST VERY DARK BROWN/BLACK high silt content	D-2.6 R-0.0		
	2					
				2.6		2.6
	3					6 1/4" Rock Bit 3 1/2" Drill Rods Drill Fluids: Betonite muds 150 gal. H_2O 50 lbs. Betonite Viscosity: 33 sec/qt. Log from Cuttings Gravity Feed
			4.0'			
	4		SILTY LEAN CLAY STIFF MOIST GRAYISH BROWN			
	5					
	6					
	7					
	8		8.5'			
			SILTY LEAN CLAY STIFF MOIST BROWNISH GRAY Gray Mottling			
	9					
	10					

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PROJECT: Munister Federal Complex | HOLE NO. NS-41

Hole No. NS-41

DRILLING LOG	DIVISION	INSTALLATION	SHEET 2 OF 7 SHEETS

1. PROJECT: Bannister Federal Complex Seismic
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number): NS-41
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (USM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: P. T. Nunnink

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	11		(Same as above) SILTY LEAN CLAY moist STIFF/MEDIUM BROWNISH GRAY gray mottling sand-size grit (medium)			6¼" Rock Bit Cont'd Gravity feed Log from Cuttings Rapid Rotation Fast Advance
	12					
	13					
	14					
	15					
	16					
	17					
	18					Add 10 gal. H_2O to sump. Viscosity 33.5 sec./qt.
	19					

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PROJECT: Bannister Federal Complex | HOLE NO. NS-41

Hole No. NS-41

DRILLING LOG	DIVISION	INSTALLATION	SHEET 3 OF 7 SHEETS
1. PROJECT: Bannister Federal Complex Site		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): NS-41		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING: %	
		19. SIGNATURE OF INSPECTOR: [illegible]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	20		(Same As Above) SILTY LEAN CLAY STIFF MOIST BROWNISH GRAY gray mottling			6 1/4" Rock Bit (cont'd) Gravity Feed Dog from Cuttings
	21		21.0' SILTY LEAN CLAY MOIST MEDIUM DARK BROWNISH GRAY gray mottling sand-size grit (Fine)			rapid rotation rapid advance use bucket to 25'
	22					
	23					
	24					use bucket
	25					
	26					
	27		27.0' SILTY LEAN CLAY MOIST MEDIUM BLUISH GRAY Sand-size grit (medium to fine) small gravel-size particles			
	28					
	29					

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PROJECT: Bannister Federal Complex HOLE NO.: NS-41

Hole No. NS-41

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 7 SHEETS

1. PROJECT: Bannister Federal Complex Seismic
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number): NS-41
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (USGS or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR (N. W. [illegible])

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	31		(Same as above) SILTY LEAN CLAY MOIST MEDIUM BLUISH GRAY Sand - fine grit small gravel-size particles			6¼" Rock Bit Gravity Feed Log from Cuttings Rapid Rotation Quick advance
	32		32.0' Silty Lean clay MOIST MEDIUM LIGHT GRAYISH BROWN high silt content			Add 10 gal. H_2O -to Sump.
	33					
	34					Large cuttings coming up boring. ±2" dia
	35					
	36					
	37					
	38		38.0' CLAY GRAVEL MEDIUM SATURATED YELLOWISH BROWN fine to coarse gravel 30-40% clay limestone gravel angular			
	39					add .10 gal. to Sump.
	40					

Hole No. NS-41

DRILLING LOG	DIVISION	INSTALLATION	SHEET 5 OF 7 SHEETS
1. PROJECT: Bannister Federal Complex Site		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): NS-41		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN: 43.3		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK: 10.7		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE: 54.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR: C. Stanwick	

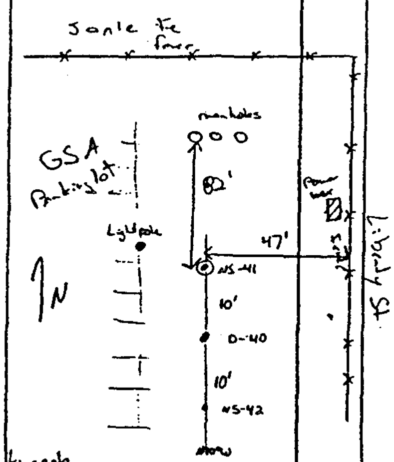
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	41		(same as above) CLAY GRAVEL MEDIUM SATURATED YELLOWISH BROWN fine to coarse gravel with 30% - 40% clay limestone gravel angular 41.6'			6¼" Rock Bit Gravity Feed Log from Cuttings
	42		GRAVEL DENSE SATURATED BROWN fine to coarse gravel angular to rounded (limestone) +/- 10% clay			Rig Chatter →
	43		TOP OF BEDROCK 43.3'			Add 15 gal. to sump. Top of bedrock as per driller, drill cuttings
						END DAY 5/26/94
	44		PLEASANTON GROUP SHALY, SILTSONE SOFT/MODERATELY HARD PARTING/BANDED VERY FINE GRAINED LIGHT GREENISH GRAY occasional fine sand <10% micaceous siltstone w/10-20% shale			Begin Day 5-27-94 6¼" Rock bit Viscosity 34 sec/qt
	45					pulldown pressure 150 psi
	46					slow rotation slow advance
	47					rate 3 min/ft rig chatter →
	48					
	49					
	50					

Hole No. NS-41

DRILLING LOG

DIVISION	
INSTALLATION	
SHEET 6 OF 7 SHEETS	
1. PROJECT	Brunnister Fed Complex
2. LOCATION (Coordinates or Station)	
3. DRILLING AGENCY	
4. HOLE NO. (As shown on drawing title and file number)	NS-41
5. NAME OF DRILLER	
6. DIRECTION OF HOLE	☐ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	
8. DEPTH DRILLED INTO ROCK	
9. TOTAL DEPTH OF HOLE	
10. SIZE AND TYPE OF BIT	
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
12. MANUFACTURER'S DESIGNATION OF DRILL	
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED: / UNDISTURBED:
14. TOTAL NUMBER CORE BOXES	
15. ELEVATION GROUND WATER	
16. DATE HOLE	STARTED: / COMPLETED:
17. ELEVATION TOP OF HOLE	
18. TOTAL CORE RECOVERY FOR BORING	%
19. SIGNATURE OF INSPECTOR	[illegible]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	50		(SAME AS ABOVE) PLEASANTON GROUP SHALY SILTSTONE SOFT / MODERATELY HARD PARTING / BANDING VERY FINE GRAINED LIGHT GREENISH GRAY occ. fine sand <10% micaceous siltstone w/ 10-20% shale			6¼" rabbit (Cont) pulldown pressure 150 psi rig chatter →
	51					
	52					
	53					
	54	540	540	540	540	540
			540' BOH. No Refusal			- GW level undeterminable w/ this drilling method - 538' ~~pvc~~ 4" Sch 40 PVC casing set in boring 50 lbs cement + 50 lbs bentonite w/ 37.5 gal H_2O dry mixed then wet mixed + tremied to grout in casing - Air monitoring while drilling (no hits) - installation diagram pg. 7
	55					
	56					
	57					
	58					
	59					
	60		* not to scale			



* not to scale

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PROJECT: Brunnister Federal complex | HOLE NO. NS-41

Hole No. US-41

DRILLING LOG | DIVISION MRD | INSTALLATION ECA | SHEET 1 OF 7 SHEETS

1. PROJECT: Bannister Fed Complex Seismic
2. LOCATION (Coordinates or Station): Ser Shell No. 6
3. DRILLING AGENCY: C.O.E
4. HOLE NO. (As shown on drawing title and file number): US-41
5. NAME OF DRILLER: M. Cooney
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 43.3
8. DEPTH DRILLED INTO ROCK: 10.7
9. TOTAL DEPTH OF HOLE: 54.0
10. SIZE AND TYPE OF BIT: 9" Rock, Tricone Type 6 1/4" Rock
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 0 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not determinable
16. DATE HOLE: STARTED 5-26-94 | COMPLETED 5-27-94
17. ELEVATION TOP OF HOLE: N/A
18. TOTAL CORE RECOVERY FOR BORING: 0 %
19. SIGNATURE OF INSPECTOR: C. Spencer

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			cold patch asphalt in annulus			
			1/4" steel plate			Ground level
						MSL
						Riser
						-.03' top of casing
						1.0' depth of grout
			natural ground			
			bentonite pellets in annulus			2.0'
			Steel protective conductor			2.6' bottom of surface casing
						8" Sch 40 PVC surface casing
						20' lengths
			Pipe JT			13.0'
						4" Sch 40 PVC. Casing
			centralizer			27.0'
						Annulus backfilled w/ 50% cement, 50% bentonite (Grout)
						50 lbs cement, 50 lbs bentonite
						37 gal H2O dry mixed then water added + mixed
						Trimmed from bottom of hole through entire bail valve
			Pipe JT.			33.0'
			centralizer			49.8'
						6 1/4" boring diameter
			Ballvalve			53.8'
			BOH 54.0'			* not to scale

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PROJECT: Bannister Fed Complex | HOLE NO. US-41

Boring D-40

Northeast Parking Lot

Hole No. D-40

DRILLING LOG	DIVISION MRD	INSTALLATION KCO	SHEET 1 OF 7 SHEETS
1. PROJECT Bannister Federal Complex		10. SIZE AND TYPE OF BIT 9" Hollow Stem Auger / 6¼" Rock bit	
2. LOCATION (Coordinates or Station) NCC Site (Page 6)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL 1⅜" split spoon	
3. DRILLING AGENCY C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number) D-40		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 8	UNDISTURBED
5. NAME OF DRILLER D. Magis		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER Not Available	
7. THICKNESS OF OVERBURDEN 41.9		16. DATE HOLE STARTED 5-31-94 COMPLETED 5-21-94	
8. DEPTH DRILLED INTO ROCK 10.1		17. ELEVATION TOP OF HOLE NA	
9. TOTAL DEPTH OF HOLE 52.0		18. TOTAL CORE RECOVERY FOR BORING ____ %	
		19. SIGNATURE OF INSPECTOR [signature]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Asphalt 0.3			9" hollow Stem Augers Log from cuttings
			Crushed Stone (Limestone) Limestone (1" MAX dia) Topsoil/natural ground 0.7			Auger 2.7' 8" Sch 40 PVC - Surface casing
	1		SILTY LEAN CLAY STIFF/VERY STIFF MOIST VERY DARK BROWN/BLACK high silt content	D-2.7 R-0.0		Silt and soil backfill around patch asphalt
	2					
				2.7		2.7
	3					6¼" Rock bit 3⅝" Drill Rods Drilling Fluid H₂O Log from Cuttings Gravity feed
	4					
			5.0	5.0	5.0	5.0
	5		SILTY LEAN CLAY VERY STIFF moist BROWNISH GRAY red mottling (rusting) fine limestone gravel inclusions (semi-angular) small amount of organic material	5-6.5 R-1.5	J-1	SPT-1 6 blows 1⅜" split spoon 3 C.O. Sediment with organic 8 N-Value Crushed Limestone 9
	6			6.5	6.5	6.5
	7					6¼" Rock bit Log from Cuttings Gravity feed
	8		8.5			
	9		SILTY LEAN CLAY MEDIUM moist YELLOWISH BROWN gray mottling occasional fine gravel			
	10					

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PROJECT Bannister Federal Complex Sediment | HOLE NO. D-40

Hole No. D-40

DRILLING LOG	DIVISION MRO	INSTALLATION KCO	SHEET 2 OF 7 SHEETS
1. PROJECT Bannister Federal Complex Seabee		10. SIZE AND TYPE OF BIT 9" Hollow Auger / 6¼" Rock Bit	
2. LOCATION (Coordinates or Station) See Sketch - Page 6		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number) D-40		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED	UNDISTURBED
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED	COMPLETED
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE OA	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR [signature]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	11		(Same as above) SILTY LEAN CLAY MEDIUM MOIST YELLOWISH BROWN gray mottling occasional fine limestone gravel	D-1.5 R-1.9	J-2	SPT-2 blows 1 3/8" Split Spoon 3 C.O. Stewart Old Rope - 2 wraps 2 N-Rods Clean out w/rock bit 2
	12			11.5	10.9	11.5
	13					6¼" Rock bit Log from cuttings Gravity feed
	14		14.5'			
	15		SILTY LEAN CLAY STIFF MOIST BROWN red and gray mottling	15.0	15.0	15.0
	16			D-1.5 R-1.5	J-3	SPT-3 blows 1 3/8" Split Spoon 1 C.O. Stewart Old Rope - 2 wraps 3 N-Rods Clean out w/rock bit Settled 0.3' by wt. of tools 3
	17			16.5	16.5	16.5
	18		17.0			6¼" Rock bit Log from cuttings Gravity feed Add 10 gal H₂O to sump
	19		SILTY LEAN CLAY MEDIUM MOIST DARK GRAY w/ fine gravel - limestone/siltstone			
	20					

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PROJECT Bannister Federal Complex Seabee | HOLE NO. D-40

Hole No. D-40

DRILLING LOG	DIVISION MRD	INSTALLATION KCO	SHEET 3 OF 7 SHEETS

1. PROJECT: Bannister Federal Complex Seismic
2. LOCATION (Coordinates or Station): See Sketch - Page 6
3. DRILLING AGENCY: C.O.E
4. HOLE NO. (As shown on drawing title and file number): D-40
5. NAME OF DRILLER:
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE:
10. SIZE AND TYPE OF BIT: ~~Hollow~~ Stem Auger / 6 1/4" Rock Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION GROUND WATER:
16. DATE HOLE: STARTED / COMPLETED
17. ELEVATION TOP OF HOLE: NA
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	21		(Same as above) SILTY LEAN CLAY MEDIUM MOIST DARK GRAY occ. fine limestone / siltstone gravel	D-15 R-15	J-4	SPT - 4 Blows 1 3/8" Split Spoon 2 C.O. Stewart Old Rope - 2 wraps 2 D- Rods Clean out w/rock bit 2
				21.5	21.5	21.5
	22					6 1/4" Rock bit Log from cuttings Gravity feed
	23					
	24					
	25			25.0	25.0	25.0
				D-15 R-14	J-5	SPT - 5 Blows 1 3/8" Split Spoon 2 C.O. Stewart Old Rope - 2 wraps 2 D-Rods Clean out w/ rock bit 3
	26			26.5	26.4	26.5
	27					6 1/4" Rock bit Log from cuttings Gravity feed
	28					Mud Viscosity 30 sec./qt.
	29		26.0 SILTY LEAN CLAY VERY STIFF MOIST BLUISH GRAY mottling high SPT count			
	30					

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PROJECT: Bannister Federal Complex Seismic | HOLE NO. D-40

Hole No. D-40

DRILLING LOG	DIVISION MRO	INSTALLATION KCP	SHEET 4 OF 7 SHEETS
1. PROJECT Bannister Federal Complex Seismic		10. SIZE AND TYPE OF BIT 9" Hollow Stem Auger/6¼" Rock Bit	
2. LOCATION (Coordinates or Station) See Sketch - Page 6		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number) D-40		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE NA	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR C. Stewart D	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	31		(Same As Above) SILTY LEAN CLAY VERY STIFF MOIST BLUISH GRAY rust staining high silt content	D-15 R-15	J-6	SPT-6 Blows 1 3/8" Split Spoon 6 C.O. Stewart Old Rope - 2 wraps 8 N-Rods clean out w/rock bit 10
			heavy rust staining	31.5	31.5	31.5
	32					6¼" Rock bit Log from Cuttings Ground Seal Add 10 gal H_2O
	33		33.7'			
	34		SILTY LEAN CLAY STIFF MOIST LIGHT GRAY rust staining high silt content occ. gravel <1/2" (rocks)			
	35		heavy rust (concretion)	33.0	33.0	35.0
				0-1.5 R-1.5	J-7	SPT-7 Blows 1 3/8" Split Spoon 2 C.O. Stewart Old Rope - 2 wraps 4 N-Rods clean out w/rock bit 4
	36			36.5	36.5	36.5 settled 0.1' by weight of Tools
	37					6¼" Rock bit Ground Seal Log from Cuttings
	38					
	39					

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PROJECT Bannister Federal Complex Seismic HOLE NO. D-40

Hole No. D-40

DRILLING LOG	DIVISION MRD	INSTALLATION KCD	SHEET 5 OF 7 SHEETS
1. PROJECT: Bannister Federal Complex Seismic		10. SIZE AND TYPE OF BIT: 6" Hollow Stem Auger 6½" Rock Bit	
2. LOCATION (Coordinates or Station): See Sketch – Page 6		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL	
3. DRILLING AGENCY: C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500	
4. HOLE NO. (As shown on drawing title and file number): D-40		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR: C. Stewart	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	41		(Same as above) SILTY LEAN CLAY 40.3		D-8 40.3	SPT-8 Blows 1 3/4" Split Spoon 5
			CLAY GRAVEL MEDIUM SATURATED GRAYISH BROWN fine to coarse gravel w/20-30% clay limestone gravel, semi-rounded	D-1.5 R-0.3		C.O. Stewart Old Rope - 2 wraps 5 N-Rods Clean out w/rock bit 3 41.5 Spoon Blocked by GRAVEL
	42		TOP OF BEDROCK 41.9	41.5		6 1/4" Rock Bit
			PLEASANTON GROUP SHALY SILTSTONE SOFT TO MODERATELY HARD PARTING VERY FINE GRAIN GREENISH GRAY micaceous SILTSTONE w/10-20% shale occ. hard zones			Log from cuttings Top of bedrock as per driller, drill action, and cuttings.
	43					
	44					Feed pressure 200 psi.
	45					
	46					Rig chatter →
	47					
	48					
	49					
	50					

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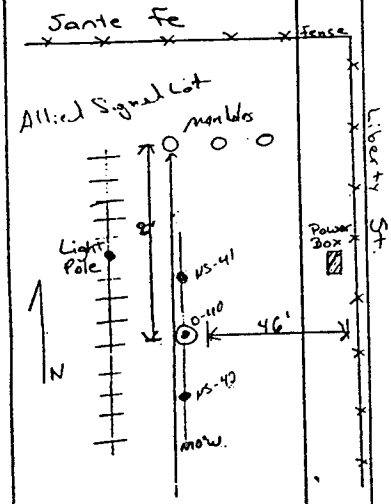
PROJECT: Bannister Federal Complex Seismic HOLE NO. D-40

Hole No. D-40

DRILLING LOG	DIVISION MRD	INSTALLATION KCO	SHEET 6 OF 7 SHEETS
1. PROJECT Bannister Federal Complex Seismic		10. SIZE AND TYPE OF BIT 9" Tailing 3¾in Auger/6¼" Rock Bit	
2. LOCATION (Coordinates or Station) Near Fields - Tango Co		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY S.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number) D-40		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED	UNDISTURBED
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED	COMPLETED
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE NA	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR [signature]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	51		(same as above) PLEASANTON GROUP SHALY SILTSTONE SOFT TO MODERATELY HARD PARTING VERY FINE GRAIN GREENISH GRAY micaceous siltstone w/10-20% shale occ. hard zones			6¼" Rock Bit Log from cuttings
	52	52.0	52.0	52.0	53.0	52.0
			B.O.H. 52.0' No Refusal			GW level undetermined within drilling method 51.8' 4" Sch 40' P.V.C. casing set in bore 50 lbs cement 50 lbs bentonite w/ 1375' H2O dry mixed allowed to ground in casing Air Monitoring while drilling (no hits) installation diagram pg. 7



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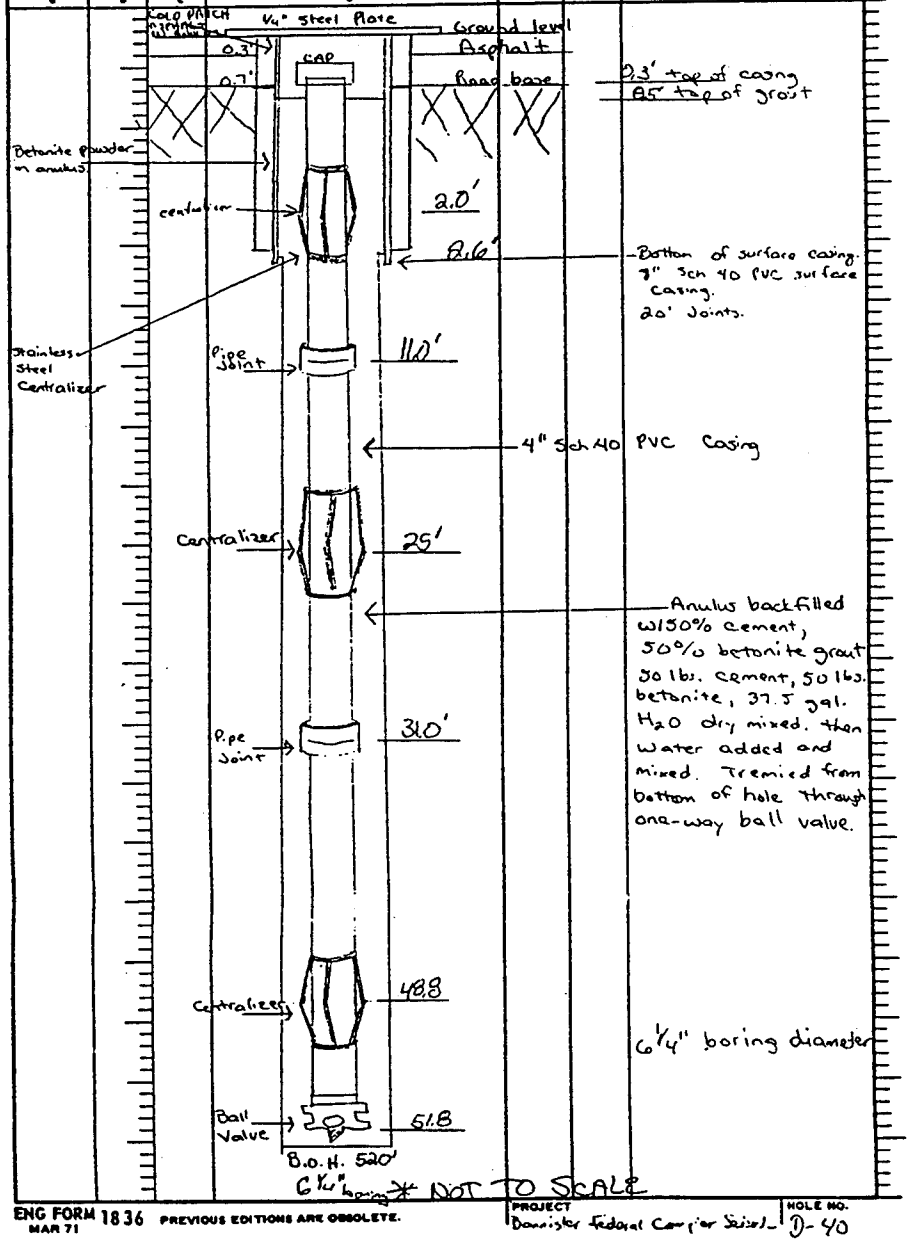
PROJECT Bannister Federal Complex Seismic HOLE NO. D-40

Hole No. D-40

DRILLING LOG	DIVISION MRD	INSTALLATION KCO	SHEET 1 OF 1 SHEETS

1. PROJECT: Bannister Federal Complex Seismic
2. LOCATION (Coordinates or Station): See Sketch - Page 1a
3. DRILLING AGENCY: C.O.E.
4. HOLE NO. (As shown on drawing title and file number): D-40
5. NAME OF DRILLER: D'Mario
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 11.4
8. DEPTH DRILLED INTO ROCK: 10.1
9. TOTAL DEPTH OF HOLE: 52.0
10. SIZE AND TYPE OF BIT: 9" Hollow Stem Auger 6¼" Rock Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 8; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: Not Available
16. DATE HOLE: STARTED 5-31-94; COMPLETED 6-21-94
17. ELEVATION TOP OF HOLE: DA
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g



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PROJECT: Bannister Federal Complex Seismic | HOLE NO. D-40

Boring D-42

Northeast Parking Lot

Hole No. NJ-42

DRILLING LOG	DIVISION MRD	INSTALLATION KSO	SHEET 1 OF 7 SHEETS
1. PROJECT Bannister Federal Complex		10. SIZE AND TYPE OF BIT 9" Hollow Stem Auger / 6¼" Rock Bit	
2. LOCATION (Coordinates or Station) See Sketch Pg. 6		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY Corps of Engineers		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number) NJ-42		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED -0-; UNDISTURBED -0-	
5. NAME OF DRILLER DiMiguis		14. TOTAL NUMBER CORE BOXES -0-	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER Not determinable	
7. THICKNESS OF OVERBURDEN 42.0'		16. DATE HOLE STARTED 6-1-94; COMPLETED 6-1-94	
8. DEPTH DRILLED INTO ROCK 11.0'		17. ELEVATION TOP OF HOLE NA	
9. TOTAL DEPTH OF HOLE 53.0'		18. TOTAL CORE RECOVERY FOR BORING — %	
		19. SIGNATURE OF INSPECTOR [signature]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			ASPHALT 0.3'			9" Hollow Stem Auger
			CRUSHED STONE (roadbase) Limestone (2" max. dia)			Log from Cuttings
			TOP OF NATURAL GROUND 0.7'			Place 2.6' 3" SCH-40 PVC Surface Casing
	1		SILTY LEAN CLAY STIFF MOIST VERY DARK BROWN (BLACK	D-2.6 R-0.0		Fill annulus w/bentonite and cold-patch asphalt
	2		high silt content			
				2.6		2.6
	3					6¼" Rock Bit
						3½" Drill Rods
	4					Drill fluids: Bentonite Muds 150 gal. H_2O ~~50 lbs. bentonite~~
			4.5			
	5		SILTY LEAN CLAY VERY STIFF MOIST GRAYISH BROWN			Viscosity: 28 sec./qt.
	6					Log from Cuttings
						Gravity Feed
	7					
	8		8.5			
	9		SILTY LEAN CLAY MEDIUM MOIST LIGHT GRAYISH BROWN GRAY MOTTLING OCC. fine gravel (limestone) OCC. sand seam probable			
	10					

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PROJECT Bannister Federal Complex HOLE NO. NJ-42

Hole No. NS-42

DRILLING LOG	DIVISION: MRD	INSTALLATION: KCD	SHEET 2 OF 7 SHEETS
1. PROJECT: Dannigter Federal Complex Delineation		10. SIZE AND TYPE OF BIT: 9" Hollow Stem Auger / 6¼" Rock Bit	
2. LOCATION (Coordinates or Station): see sketch Fig. 6		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL	
3. DRILLING AGENCY: C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): NS-42		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED —0— UNDISTURBED —0—	
5. NAME OF DRILLER: D. Marcuis		14. TOTAL NUMBER CORE BOXES: —0—	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: Not determinable	
		16. DATE HOLE: STARTED	COMPLETED
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE: NA	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING: — %	
9. TOTAL DEPTH OF HOLE		19. SIGNATURE OF INSPECTOR: [signature]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	11		(SAME AS ABOVE) SILTY LEAN CLAY MEDIUM MOIST LIGHT OLIVE BROWN dry mottling. occ. fine gravel (flinders) occ. sand size particles			6¼" Rockbit Log from cuttings Ground Surface Rapid Rotation Rapid Advance
	12					
	13					
	14					
	15					
	16					
	17		17.0 SILTY LEAN CLAY MEDIUM MOIST BROWN gray mottling occ. sand size particles			Add 10 gal. H_2O to sump →
	18					
	19					
	20					

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PROJECT: Dannigter Federal Complex HOLE NO. NS-42

Hole No. NS-42

DRILLING LOG	DIVISION MRD	INSTALLATION KCO	SHEET 3 OF 7 SHEETS
1. PROJECT Bannister Federal Complex Expansion		10. SIZE AND TYPE OF BIT 9" Hollow stem Auger / 6¼" Rock Bit	
2. LOCATION (Coordinates or Station) See Sketch		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number) NS-42		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED -0-	UNDISTURBED -0-
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES -0-	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER Not determinable	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED	COMPLETED
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE NA	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING — %	
		19. SIGNATURE OF INSPECTOR C. Almeida	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			(SAME AS ABOVE) SILTY LEAN CLAY MEDIUM MOIST BROWN Gray mottling occ. sand size particles			6¼" Rock bit (cont'd)
	21		21.0 SILTY LEAN CLAY MEDIUM MOIST DARK Grey occ. fine limestone (rock)			Log from cuttings Greasy feel Rapid Rotation Rapid Advance
	22					
	23					
	24					
	25					
	26					
	27					
	28		28.0 SILTY LEAN CLAY VERY STIFF moist BLUISH GRAY rust staining high silt content			Add 10 gal. H_2O to Sump →
	29					
	30					

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PROJECT Bannister Federal Complex HOLE NO. NS-42

Hole No. NS-42

DRILLING LOG	Division MRD	Installation TCD	Sheet 4 of 7 Sheets
1. Project: Bannister Federal Complex Seismic		10. Size and Type of Bit: 9" Hollow Stem Auger/NW Rock Bit	
2. Location (Coordinates or Station): See Sketch.		11. Datum for Elevation Shown (TBM or MSL): MSL	
3. Drilling Agency: C.O.E.		12. Manufacturer's Designation of Drill	
4. Hole No. (As shown on drawing title and file number): NS-42		13. Total No. of Overburden Samples Taken: Disturbed -0-; Undisturbed -0-	
5. Name of Driller		14. Total Number Core Boxes: -0-	
6. Direction of Hole: ☑ Vertical ☐ Inclined ____ Deg. From Vert.		15. Elevation Ground Water: Not determinable	
7. Thickness of Overburden		16. Date Hole: Started; Completed	
8. Depth Drilled Into Rock		17. Elevation Top of Hole: NA	
9. Total Depth of Hole		18. Total Core Recovery for Boring: — %	
		19. Signature of Inspector: C. Hamrick	

Elevation (a)	Depth (b)	Legend (c)	Classification of Materials (Description) (d)	% Core Recovery (e)	Box or Sample No. (f)	Remarks (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	31		(Same as above) SILTY LEAN CLAY VERY STIFF MOIST BLUISH GRAY rust staining high silt content			6 1/4" Rock bit Ground Surface Log Soil cuttings Rapid Rotation Moderate advance
	32				1	
	33		33.0 SILTY LEAN CLAY STIFF MOIST LIGHT GRAY .high silt content .rust staining acc. gravel 10% (medium)			
	34					
	35					
	36					
	37					
	38					Add 10 gal. H2O to sump →
	39					
	40					

Hole No. NS-42

DRILLING LOG	DIVISION MRD	INSTALLATION KSO	SHEET 5 OF 7 SHEETS
1. PROJECT: Bannister Federal Complex Seismic		10. SIZE AND TYPE OF BIT: 7" Hollow Stem Auger / 6¼" Rock Bit	
2. LOCATION (Coordinates or Station): See Sketch		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL	
3. DRILLING AGENCY: C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): NS-42		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED —0— UNDISTURBED —0—	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES —0—	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: Not determinable	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED ____ COMPLETED ____	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE: NA	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING — %	
		19. SIGNATURE OF INSPECTOR: S. Hammack	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	41		(Same as above) SILTY LEAN CLAY STIFF MOIST LIGHT GRAY high silt content rust staining occ. gravel <10% (medium)			6¼" Rock bit
			41.4 CLAY GRAVEL MEDIUM SATURATED GRAYISH BROWN fine to coarse gravel w/ 20-30% clay limestone gravel. Gravel (rounded)			Log from Cuttings. Rig Chatter → Pulldown ↓
	42		42.0 TOP OF BEDROCK			
	43		43.0 PLEASANTON GROUP SHALY SILTSTONE SOFT TO MODERATELY HARD PARTING VERY FINE GRAIN LIGHT BROWN weathered micaceous occ. fine sand			Tagged Bedrock as per driller, drillation, & cuttings
	44					
	45		PLEASANTON GROUP SHALY SILTSTONE SOFT TO MODERATELY HARD PARTING VERY FINE GRAIN GRAY micaceous Siltstone w/10-20% shale occ. hard zones			Drawdown Pressure 400 P.S.I.
	46					
	47					Rig Chatter →
	48					
	49					Rig Chatter →
	50					

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PROJECT: Bannister Federal Complex HOLE NO.: NS-42

Hole No. NJ-12

DRILLING LOG	DIVISION MRO	INSTALLATION KCO	SHEET 6 OF 7 SHEETS
1. PROJECT Bannister Federal Complex		10. SIZE AND TYPE OF BIT 9" Hollow Stem Auger / 6¼" Rock Bit	
2. LOCATION (Coordinates or Station) See Sketch		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and title number) NJ-12		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED -0-	UNDISTURBED -0-
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES -0-	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER Not determinable	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED	COMPLETED
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE NA	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING — %	
		19. SIGNATURE OF INSPECTOR [signature]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	51		(Same as above) PLEASANTON GROUP SHALY SILTSTONE SOFT TO MODERATELY HARD PARTING VERY FINE GRAINED GRAY micaceous siltstone w/10-20% shale occ. hard zones			6¼" Rock Bit Log from cutting 400 P.S.I. pulldown pressure
	52					
	53	53.0	53.0	53.0	53.0	53.0
			B. O. H. 53.0' No Refusal			Groundwater table undeterminable with this drilling method.
	54					- 52.8' 4" SCH 40' P.V.C. casing section set in boring. 50 lbs. cement + 50 lbs. betonite w/37.5 gal. H_2O dry mixed and tremied to grout casing.
	55		Sante Fe fence			- Air monitoring while drilling. No hits.
	56		Allied Signal Lot manholes			- Installation diagram pg. 7.
	57		Light Pole 102' NS-11 D-40 46' NS-13 N10°W Power Box 57'			G.S.A. LOT
	58		N			
	59		*not to scale			
	60					

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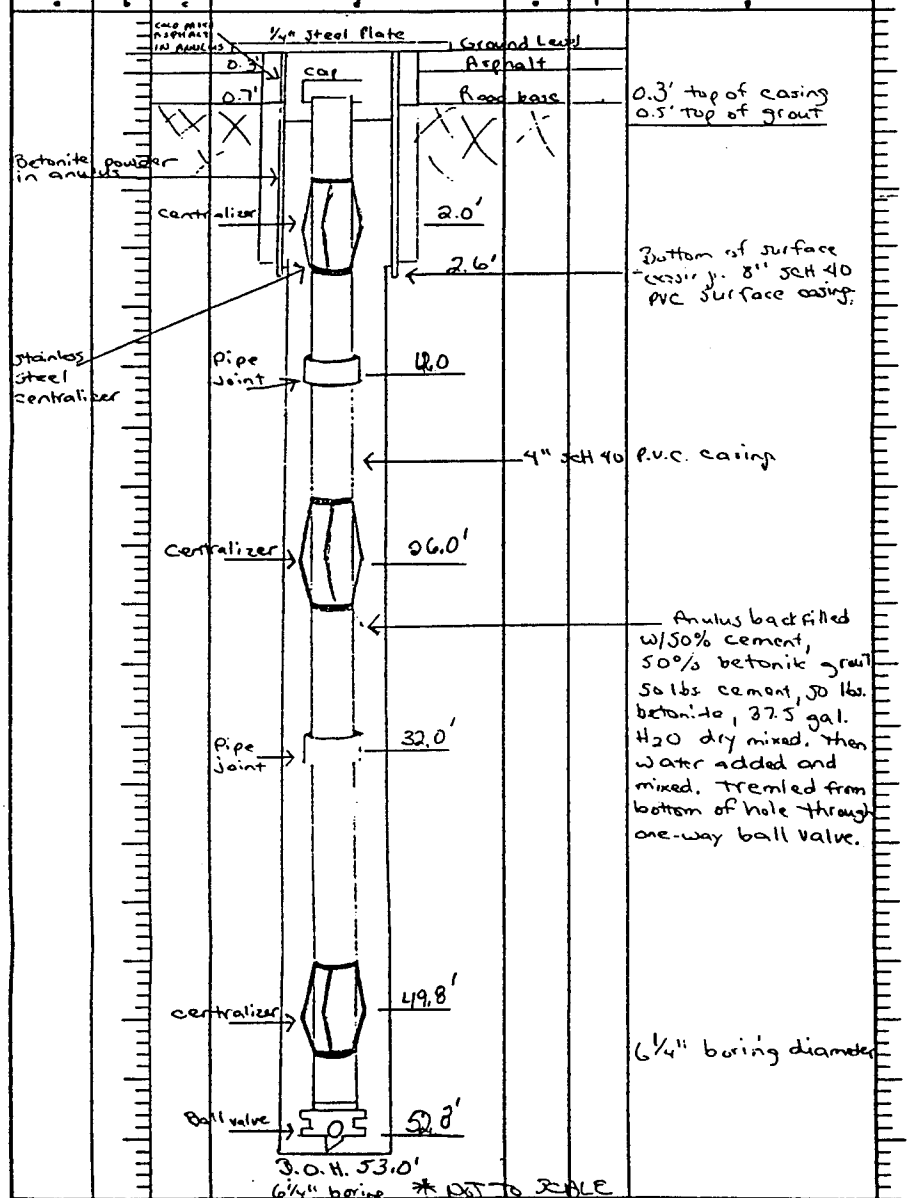
PROJECT Bannister Federal Complex | HOLE NO. NJ-12

Hole No. NS-42

DRILLING LOG	DIVISION MRD	INSTALLATION KCD	SHEET 7 OF 7 SHEETS

1. PROJECT: Bannister Federal Complex Investigation
2. LOCATION (Coordinates or Station): See Sketch Pg. 6
3. DRILLING AGENCY: C o E
4. HOLE NO. (As shown on drawing title and file number): NS-42
5. NAME OF DRILLER: D. Marquis
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 42.0'
8. DEPTH DRILLED INTO ROCK: 11.0'
9. TOTAL DEPTH OF HOLE: 53.0'
10. SIZE AND TYPE OF BIT: 9" Hollow Stem Auger 16 1/4" Rock Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED -0- UNDISTURBED -0-
14. TOTAL NUMBER CORE BOXES: -0-
15. ELEVATION GROUND WATER: Not determinable
16. DATE HOLE: STARTED 6-1-94 COMPLETED 6-1-94
17. ELEVATION TOP OF HOLE: NA
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: D. Marquis

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g



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PROJECT: Bannister Federal Complex HOLE NO. NS-42

Boring D-45

Southeast Parking Lot

Hole No. NS 45

DRILLING LOG	DIVISION MRD	INSTALLATION KCO	SHEET 1 OF 7 SHEETS
1. PROJECT Bannister Fed Coupler Seismic		10. SIZE AND TYPE OF BIT 9" Hollow stem auger, Cdi Rock	
2. LOCATION (Coordinates or Station) See Sketch fig 6		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY C.O.E		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number) NS 45		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 0	UNDISTURBED 0
5. NAME OF DRILLER M. Cooney		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER not attempted	
7. THICKNESS OF OVERBURDEN 45.0		16. DATE HOLE: STARTED 5-25-94	COMPLETED 5-25-94
8. DEPTH DRILLED INTO ROCK 11.0		17. ELEVATION TOP OF HOLE N/A	
9. TOTAL DEPTH OF HOLE 56.0		18. TOTAL CORE RECOVERY FOR BORING ____ %	
		19. SIGNATURE OF INSPECTOR [illegible]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Asphalt 0.5'			9" Hollow Stem Auger
			Crushed Stone Road Base (Limestone) max size 2"			D=2.4
	1		Topsoil natural ground 1.1'			R=0.0
			SILTY LEAN CLAY STIff MOIST GRAY/BROWN occ. rusting occ. sand partings (medium) (Limestone angular)			Place 2.4' 8" sch 40 PVC surface casing
	2					Fill annulus w/ bentonite & cold patch asphalt
						2.4
	3					6 1/4" Rock bit 3 1/8" Down Hole Drill Using Bentonite mud
	4					150 gal H_2O 75 lbs bentonite viscosity 46 sec/qt
	5		5.0'			Log from Cuttings
			Silty LEAN CLAY STIff MOIST GRAY (dark) occ. sand stringers (medium) (limestone) organics			drill down pressure 200psi change @ 4'
	6					
	7		7.5'			
	8		SILTY LEAN CLAY MEDIUM MOIST BROWN occ. weathering organics dark spots throughout (mottled gray zones)			Medium consistency determined by size of cuttings & downward ease of drill
	7					
	10					

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PROJECT Bannister Fed Coupler | HOLE NO. NS 45

Hole No. NS 45

DRILLING LOG	DIVISION	INSTALLATION	SHEET 2 OF 7 SHEETS

1. PROJECT: Bayonne Jct Complex
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number): NS 45
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED: — UNDISTURBED:
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE — STARTED: — COMPLETED:
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: [illegible]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10		(Same As Above) SILTY LEAN CLAY — MEDIUM MOIST BROWN occ. mottling occ. dk. brown spots			6 ¼" Rotbit (Cont) Ground Seal from 10' Add 5gal H2O → Cuttings are loose pieces ~¾ dia. Log from Cuttings Uncased 45.5 set/at → Add 10gal H2O →
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					

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PROJECT: Bayonne Jct Complex HOLE NO. NS 45

Hole No. NS-45

DRILLING LOG	DIVISION	INSTALLATION	SHEET 3 OF 7 SHEETS

1. PROJECT Trincomalee Naval Complex	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (USGS or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) NS-45	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE: STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR (illegible)

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	20		(Same As Above) SILTY LEAN CLAY MEDIUM MOIST BROWN occ. dark brown specks			6¼" Rubbit (rock) gravity feed rapid rotation Large cuttings recovered ~23" dia. Log from cuttings
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28		28.0' SILTY LEAN CLAY MEDIUM MOIST BROWN GRAY occ. fine-med sand			Soil consistency derived from drillation + cuttings (large)
	29					
	30					

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PROJECT Trincomalee Naval Complex HOLE NO. NS-45

Hole No. NS45

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 7 SHEETS

1. PROJECT: Bannister Fed Complex	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number): NS45	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE: STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	30		(SAME AS Above) SILTY LEAN CLAY MEDIUM MOIST BROWN GRAY occ. fine to medium sand 31.0'			6 1/4" Rock bit (Cont) Small, Steel Large pellays returned 1 3/4" dia rapid rotation rapid advance Log from cuttings.
	31		SILTY LEAN CLAY MEDIUM MOIST DARK GRAY high silt content moderately plastic From Imp cuttings			
	32					
	33					
	34					
	35					
	36					
	37					
	38					Med Viscosity 35 sec/qt
	39					
	40					

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PROJECT: Bannister Fed Complex HOLE NO. NS45

Hole No. NS-45

DRILLING LOG | DIVISION | INSTALLATION | SHEET 5 of 7 SHEETS

1. PROJECT: Bannister Fed. Complex
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number): NS-45
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: CO [illegible]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40		(SAME AS ABOVE) SILTY LEAN CLAY STIFF MOIST DARK GRAY high silt content moderately plastic fine base cuttings			6¼" Rotbit (rock) Casing Log from cuttings
	41					
	42					
	43		43.0 GRAVELLY LEAN CLAY MEDIUM Liquid limit MOIST fine to coarse DARK GRAY (angular) clay w/ 20-30% gravel 43.8			
	44		Clayey GRAVEL DENSE SATURATED LIGHT GRAY fine to coarse gravel w/ 10-20% clay (fine sand)			Top of bedrock as per driller, change in drilling cuttings ↓ 300 p.s.i pulldown pressure
	45		Top of Bed Rock 45.0 [MEASAMTON GROUP] SHALEY SILTSTONE SOFT / MODERATELY HARD PARTING VERY FINE GRAINED / DENSE GREEN GRAY occ. fine sand < 10% silt/clay w/ 10-20% shale (gray) shale-siltstone seams throughout			
	46					
	47					
	48					
	49					
	50					

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PROJECT: Bannister Fed Complex | HOLE NO. NS-45

Photo No. NS-45

DRILLING LOG | DIVISION | INSTALLATION | SHEET 6 OF 7 SHEETS

1. PROJECT: Bannister Fed Complex
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number): NS-45
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (GS or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	50		(CAMEL MEMBER)			6¼" Rock bit
			PLEASANTON GROUP			Log from cuttings
	51		SHALEY SILTSTONE			200 psi drawdown
			SOFT/MODERATELY HARD			rig chatter
	52		PARTING			slow rotation
			VERY FINE GRAINED			
			GREEN & GRAY			
	53		occ. fine sand;			Mod Uniformly
			Siltstone w/ 10-20% clay			22 sec/ft
			shale/siltstone seams throughout			
	54					rotary hard drilling from 50' to 56'
	55					
	56	560	560	560	560	560
			560' Ball. No Retard			
	57					1150 lbs bentonite drilling mud available
						Backfilled w/ 50% cement 50% bentonite grout when pulling 4" PVC casing (SOS)
			SE VIP LOT			Air monitoring w/ flame ion detector: no hits
	58		N			Installation diagram on p. 7
			N11°E DH5 10' DH3 10' DH4			Grout mixture consists of 50 lbs cement 50 lbs bentonite 37.5 gal water dry mixed then water added & mixed then transferred from bentonite tank to casing.
			55' 17' Fence			
	59		Fuel Tank			
			94th Ter			
	60					

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PROJECT: Bannister Fed Complex | HOLE NO. NS-45

Hole No. D-45

DRILLING LOG	DIVISION NPD	INSTALLATION FCO	SHEET 1 OF 7 SHEETS
1. PROJECT Bannister Jct Complex Seismic		10. SIZE AND TYPE OF BIT 7" Calyx, Steam Auger, 6¼" Rock
2. LOCATION (Coordinates or Station) So Stabil. Bldg. 6		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) D-45		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 0; UNDISTURBED 0
5. NAME OF DRILLER M. Cooney		14. TOTAL NUMBER CORE BOXES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER Not Attainable
7. THICKNESS OF OVERBURDEN 15.0		16. DATE HOLE STARTED 5-25-84 COMPLETED 5-25-84
8. DEPTH DRILLED INTO ROCK 11.0		17. ELEVATION TOP OF HOLE N/A
9. TOTAL DEPTH OF HOLE 56.0		18. TOTAL CORE RECOVERY FOR BORING ____ %
		19. SIGNATURE OF INSPECTOR C.L. Taylor, Capt.

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			8" sch 40 PVC Casing			Cement grout & soil backfill
			¼" steel plate			Bentonite around casing
			Cap			Ground level
			Backfill	0.5'		
			Backfill	1.1'		
			Weathered rock		0.3'	Below ground surface
					1.0'	Top of rock
					2.0'	Fractures
			Weathered rock		2.4'	Bottom of surface casing
			Stainless steel centralizer			
			Casing JT	15.2'		
						Annulus backfilled w/ 50% grout 50% bentonite chips
			Centralizer	22.7		
						4" Sch 40 PVC Casing 20' length
			Casing JT	35.2'		
			Centralizer	52.4'		
			One way ball valve	55.9'		
			6¼"			
			56.0 BOH			
			* Not to Scale			

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PROJECT Bannister Jct Complex | HOLE NO. D-45

Boring D-43

Southeast Parking Lot

Hole No. D-43

DRILLING LOG	DIVISION MRD	INSTALLATION KCD	SHEET 1 OF 7 SHEETS
1. PROJECT Bannister Federal Complex Seismic		10. SIZE AND TYPE OF BIT 9" Hollow Stem Augers, 6¼" Rabbit	
2. LOCATION (Coordinates or Station) See Sketch pg. 6		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	1⅜" Split Spoon
3. DRILLING AGENCY COE		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number) D-43		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 10; UNDISTURBED 0	
5. NAME OF DRILLER M. Cooney		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER Not Encountered	
7. THICKNESS OF OVERBURDEN 45.4		16. DATE HOLE: STARTED 5-24-94; COMPLETED 5-25-94	
8. DEPTH DRILLED INTO ROCK 11.6		17. ELEVATION TOP OF HOLE N/A	
9. TOTAL DEPTH OF HOLE 57.0		18. TOTAL CORE RECOVERY FOR BORING ____ %	
		19. SIGNATURE OF INSPECTOR [illegible]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Surface Asphalt Base 0.5'			9" Hollow Stem Augers CASED. Place 2.3' 8" of 40 PVC. pipe (section casing) Fill annulus between casing and rock with asphalt 2.3'
	1		Crushed Stone Fine to medium 2" Topsoil w/ limestone fragments 1.1'			6¼" Rabbit 3⅝" drill rods Drill fluid Bentonite Slurry 150 gal H2O and 75 lbs bentonite 31 sec/qt viscosity Log from cuttings Sandy loam slow to advance
	2		SILTY LEAN CLAY STIFF MOIST GRAY/BROWN occ. sand particles (limestone) angular			
	3					
	4					
	5		5.5'	5.0		5.0
	6		SILTY LEAN CLAY STIFF MOIST BGRAY/BROWN mottled 7.0	D-5 12-15 6.5	S-1	SPT-1 Blows: 1⅜" split spoon 3 C.O. Cuttings dumped ASTM Standard 2 drops 140 lb hammer 8 cleaned out Rabbit 6.5
	7		SILTY LEAN CLAY MEDIUM MOIST BROWN mottled gray/clay traces of roots			6¼" Rabbit 3⅝" drill rods Log from cuttings sandy loam
	8					
	9					
	10			100	100	100

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PROJECT Bannister Federal Complex — HOLE NO. D-43

Hole No. D-43

DRILLING LOG | DIVISION | INSTALLATION | SHEET 2 OF 7 SHEETS

1. PROJECT: Bannock Fed Center
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number): D-43
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (USBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Cliff Fagin

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10		(Same as Above) SILTY LEAN CLAY MEDIUM MOIST BROWN Sm mottles rust stains	100	100	100 Hows SPT-2 1⅜" splitspoon 2
				D-1.5		
				R-1.5	J-2	C.O. D. Cuttings 2 wraps old rope 3
	4					cleaned out Rabbit 4
				11.5	11.5	11.5
						6¼" Rabbit Mud Unweighted 3 cu/yd
	0					Log from cuttings
						gravelly fast ~~very quickly~~ & rapid rotation quick bit
	8		13.5'			
			SILTY LEAN CLAY MEDIUM MOIST BROWN low plasticity occ. dk brown spots			
	14					
	15			15.0	15.0	15.0
						SPT-3 Hows 1
				D-1.5		1⅜" splitspoon
				R-1.5	J-3	C.O. D. Cuttings 2 wraps 2 old rope
	16					cleaned out Rabbits 3
				16.5	16.5	16.5
						6¼" Rabbit
	17					Log from cuttings
						gravelly fast
	18		18.5'			
			SILTY LEAN CLAY MEDIUM MOIST LIGHT GRAY high silt content			
	19					
	20			20.0	20.0	20.0

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PROJECT Bannock Fed Center | HOLE NO. D-43

Hole No. D-43

DRILLING LOG	DIVISION	INSTALLATION	SHEET 3 OF 7 SHEETS
1. PROJECT: Bannock Fed. Complex		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): D-43		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING	%
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	20		(SAME AS Above) SILTY LEAN CLAY MEDIUM, MOIST, LIGHT GRAY	20.0	300	SPT-4 blows 1⅜" split spoon 2
			20.5	D-15		
			SILTY LEAN CLAY MEDIUM MOIST BROWN mottled gray dark spots organic	R-15	J-4	C.O.D Core Barrel old rope 2 Cleanout Rubbit 2
	21			21.5	21.5	21.5
						6¼" Rubbit
	22					Log from cuttings Mud Viscosity 32 sec/qt gravelly sand
	23					
	24		24.0'			
			SILTY LEAN CLAY MEDIUM MOIST GRAY reds stains occ. med sand c102	25.0	25.0	25.0
	25					SPT-5 blows 1⅜" split spoon 2
				D-15		
				R-13	J-5	C.O.D. Core Barrel 2 Old rope
	26				26.3	Cleanout Rubbit 4
				26.5	14	26.5
	27					6¼" Rubbit Log from cuttings gravelly sand
	28		28.5'			
			SILTY LEAN CLAY MEDIUM MOIST DARK GRAY Low plastic occ. reds stains			
	29					
	30			30.0	30.0	30.0

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PROJECT Bannock Federal Complex | HOLE NO. D-43

Hole No. D-43

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 7 SHEETS

1. PROJECT: Bannister Fed. Complex
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number): D-43
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED / COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	30		(SAME AS ABOVE) SILTY CLAY MEDIUM MOIST DARK GRAY Low plastic occ. rust stains	100	S-6	SPT-6 blows 1 3/8" spl. spoon 1
				D-1.5 R-1.5	S-6 J-6	C.O. D, Cuttings & lumps 2 old lumps Cleaned w/ rockbit 2
	31			31.5	31.5	31.5
						6 1/4" sp rockbit Log from cuttings mud unsuitable 31 cu/ft
	32					
	33					Sandy Sand
	34					
	35			35.0	35.0	35.0
						SPT-7 blows 1
				D-1.5 R-1.5	J-7	1 3/8" spl'd spoon C.O.: D, cuttings & lumps 2 old lumps
	36				36.3	Cleaned w/ Rockbit 3
				36.5	36.5	36.5
						6 1/4" Rockbit Log from cuttings
	37					
	38					Sandy, Sand quick rotation
	39					
	40			40.0	40.0	40.0

Hole No. D-43

DRILLING LOG	DIVISION	INSTALLATION	SHEET 5 OF 7 SHEETS
1. PROJECT: Bannister 2nd Complex		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (USGS or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): D-43		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40		(SAME AS ABOVE)	11/20	(40)	SPT- 8 blows
			SILTY LEAN CLAY	D-15		1 3/8" split spoon 2
	41		MEDIUM	D-15	S-8	C.O. R. McCrain 2 bumps 3 old opo
			MOIST			Cleaned w/ Rockbit 4
			DARK GRAY	41.5	41.5	41.5
			very plastic			6 1/4" Rockbit
	42		occ. rust stains			Log from cuttings
						Sandy, fine
						Mud Circulation 35 sec/qt
	43					
	44					Rig Chatter
			44.5			
			CLAYEY GRAVEL	45.0	45.0	45.0
	45		DENSE			SPT- 9 blows
			SATURATED			1 3/8" split spoon 6
			GRAY/WHITE	D-08	S-9	C.O. R. McCrain 2 bumps 3 old opo
			fine to coarse limestone gravel ± 1.5" diam.	R-47		Spoon refusal Buddy S-24-94 50
			occ. silty, silty sand 45.4'		S-10	45.8 Cleaned w/ Rockbit
			Top of BEDROCK		45.7	Top of Bedrock as per
	46		Consolidated zone PLEASANTON GROUP	45.8		recovered sample
			SHALEY SILTSTONE			6 1/4" Rockbit
			~~PAR~~ SOFT			Log from cuttings
			PARTING			Begin dry 5-25-94
	47		GREEN GRAY			100 psi air pressure to 50
			Siltstone w/ 20-30% shale			Moderately
			occ. mottling			31 sec/qt
			occ. fine sand			
	48		alternating w/ more shale Siltstone			Report 20 sal drill fluid water
	49					Drilling time from 46' to 57' 40 min.
	50			51.0	50.0	50.0

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PROJECT: Bannister 2nd Complex | HOLE NO. D-43

Hole No. D-43

DRILLING LOG | DIVISION | INSTALLATION | SHEET 1 OF 2 SHEETS

1. PROJECT: Bannister Fed Complex
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number): D-43
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	50		(SAME AS ARGUE) PLEASANTON GROUP SHALEY SILTSTONE SOFT. DARING GREEN GRAY siltstone w/ 20-30% shale occ. rusting occ. fine sand Alternating layers of shale siltstone			6¼" Rock bit (roll) Log from cuttings rig chatter 200 psi pulldown pressure rig chatter
	51					
	52		well cemented zones high $CaCO_3$ content			
	53					
	54					
	55					
	56		well cemented zone			Rig chatter →
57.0	57		57.0	57.0	57.0	57.0
	58		57.0' B.O.H No Vertical SE VIP Lot #1 N80°E 0-45 0-40 0-44 67' MS' pad swivel			H₂O level Not allowable while drilling Backfill w/ 4" PVC pipe then annulus sealed w/ 50-50 cement bentonite grout ~80 gal Air monitoring w/ Hnu no hits Installation diagram on pg. 7 50 lbs cement + 50 lbs bentonite dispersed then mixed w/ 22.5 gallons of water then dispersed through the bottom of the casing
	59		9 4/4 Tan			
	60					

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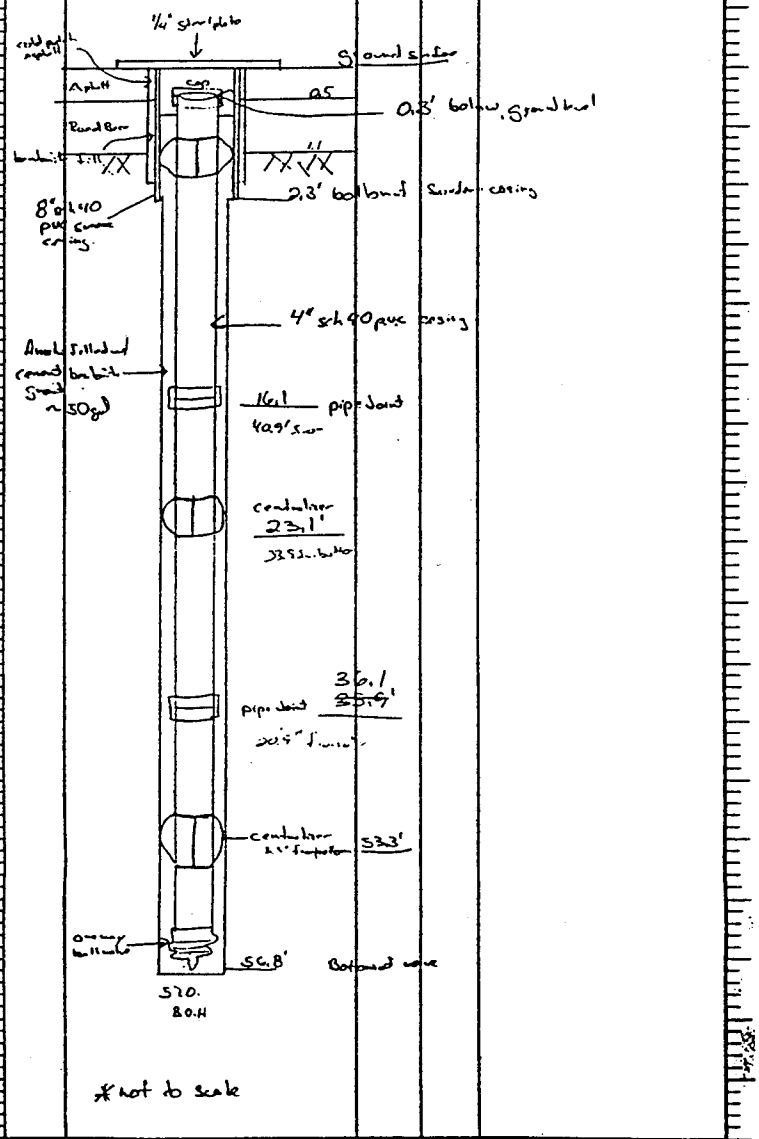
PROJECT: Bannister Fed Complex | HOLE NO. D-43

Hole No. D-43

DRILLING LOG	DIVISION MRD	INSTALLATION KCO	SHEET 1 OF 7 SHEETS
1. PROJECT Bannister Fed Complex Seismic		10. SIZE AND TYPE OF BIT 9" hollow stem augers, 6¼" roller bit	
2. LOCATION (Coordinates or Station) See Sketch Dwg		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY C.O.E.		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number) D-43		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 10	UNDISTURBED
5. NAME OF DRILLER M. Crowder		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER Not available	
7. THICKNESS OF OVERBURDEN 45.4		16. DATE HOLE STARTED 5-24-94	COMPLETED 5-25-94
8. DEPTH DRILLED INTO ROCK 11.6		17. ELEVATION TOP OF HOLE N/A	
9. TOTAL DEPTH OF HOLE 57.0		18. TOTAL CORE RECOVERY FOR BORING 0 %	
		19. SIGNATURE OF INSPECTOR [illegible]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g



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PROJECT Bannister Fed. Complex HOLE NO. D-43

Boring D-44

Southeast Parking Lot

Hole No. NS - 44

DRILLING LOG	DIVISION NED	INSTALLATION KCO	SHEET 1 OF 7 SHEETS

1. PROJECT: Bannister Jct Complex (Siesmic)
2. LOCATION (Coordinates or Station): See sketch
3. DRILLING AGENCY: C.O.E
4. HOLE NO. (As shown on drawing title and file number): NS-44
5. NAME OF DRILLER: M. Cooney
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 46.7
8. DEPTH DRILLED INTO ROCK: 10.3
9. TOTAL DEPTH OF HOLE: 57.0
10. SIZE AND TYPE OF BIT: 6¼" Rotary 9" hollow stem Auger
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 0; UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: 0
15. ELEVATION GROUND WATER: 230' ± (Estimated)
16. DATE HOLE: STARTED 5-23-94; COMPLETED 5-24-94
17. ELEVATION TOP OF HOLE: N/A
18. TOTAL CORE RECOVERY FOR BORING: _____ %
19. SIGNATURE OF INSPECTOR: [illegible]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		4" Asphalt and 0.5'			9" Hollow stem Auger 0.0 - 5' ± place 2.6' 8" sch 40 PVC pipe surrounding filterdust w/ bentonite cold patch asphalt
	1		Crushed Stone (Base) Limestone 2"- mostly sizes Topsoil w/ some gravel 1.1'			
	2		Silty Lean Clay Stiff Moist Gray/Brown occ. Sand (limestone) Angular			2.6
	3					6¼" Rotary 3⅝" drill rods Drill fluid Bentonite slurry 150 gal H2O 75 lb bentonite 33 ≤ viscosity Viscosity 33 sec/qt Log from cuttings
	4					
	5					
	6					
	7					
	8		8.0			
	9		Silty Lean Clay Medium Moist Brown occ. gray zones			
	10					

Hole No. NS-44

DRILLING LOG	DIVISION	INSTALLATION	SHEET 2 OF 7 SHEETS

1. PROJECT: Bannister Fed. Complex Service		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (USGS or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): NS-44		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR (illegible)	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10		(Same As Above) Silty LEAN CLAY MEDIUM MOIST Brown occ. stringers			6¼" Rock bit (cont)
	11					Logging cuttings
	12					
	13					Viscosity 33.5 sec/qt ←
	14					Drilling action Smoothly fast
	15					Large cuttings plastic off boring occ.
	16					Add 10 gal H2O to sump
	17					Logging inaccurate due to blinding all by cuttings
	18					
	19					
	20					

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PROJECT: Bannister Fed Complex | HOLE NO. NS-44

Hole No. NS-44

DRILLING LOG	DIVISION	INSTALLATION	SHEET 3 OF 7 SHEETS
1. PROJECT: Bannister Fed Complex Sewer		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): NS-44		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING: %	
		19. SIGNATURE OF INSPECTOR: (illegible)	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	20		(Same As Above) Silty Lean Clay MEDIUM Moist Brown			6¼" Rubbert (cont'd) Viscosity 33 sec/qt Sandy Soil Log by cuttings
	21					
	22					H_2O level 22.0' while drilling
	23	?	23.0'			Sandy Soil (penetrated very quick) cuttings decreased in size hole is clean from blockage
	24		SILTY LEAN CLAY MEDIUM / SOFT SATURATED BROWN/GRAY Organics occ. sand & gravel seams pockets occ. wet staining			H_2O level figured by materials encountered Sand, sandy clay & rubble Advanced beyond this pt.
	25					
	26					
	27					
	28					
	29					
	30					

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PROJECT: Bannister Fed Complex | HOLE NO.: NS-44

Hole No. NS-44

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 7 SHEETS
1. PROJECT: Bannister Fed. Complex Limit		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): NS-44		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR (Obijiofor Ezeigbo) Typed	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	30		(Same As above) SILTY LEAN CLAY MEDIUM/SOFT SATURATED BROWN GRAY			6¼" Calibt Log from cuttings Quick advance to 35' via gravity feed
	31					
	32					
	33					
	34					
	35		35.0' SILTY LEAN CLAY MEDIUM SATURATED GRAY (Dark) low plastic, silt content increases with depth			Footnote shows large chunks of soil came up boring & block off. drill rate ~ 1 ft/min All ISS NO.0
	36					
	37					
	38					
	39					
	40					

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PROJECT: Bannister Fed Complex HOLE NO.: NS-44

Hole No. NS-44

DRILLING LOG	DIVISION	INSTALLATION	SHEET 5 OF 7 SHEETS
1. PROJECT: Bannister Fed Complex		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number): NS-44		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	40		(SAME AS ABOVE) SILTY LEAN CLAY medium SATURATED DARK GRAY			6¼" Rotbit (cont) Viscosity 32 c/qt Log from cuttings Sandy Sand
	41					
	42		10.5'			
	43		GRAVELLY CLAY MEDIUM SATURATED GRAY Loam clayey 10-20% fine (angular) to coarse gravel (angular) max diameter 1" 48.0'			rig chatter
	44		CLAYEY GRAVEL LOOSE SATURATED GRAY fine to coarse gravel (angular) (limestone) w/ 10-20% clay max diameter 2"-3"			
	45					
	46		Top of Bedrock 46.7' Pleasanton Fm.			Sandy Sand Slapped advancement
	47		SILTY SHALE SOFT PARTING DENSE GRAY (light) occ. zones of high clay content chalky w/ 20-40% silt			pulldown pressure + 300psi slow advance
	48					
	49					
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO.

Hole No. NS-44

DRILLING LOG	DIVISION NED NRD	INSTALLATION NRD KCD	SHEET 6 OF 7 SHEETS
1. PROJECT Bannister Federal Complex Scenic		10. SIZE AND TYPE OF BIT 9" Lbs. tricone, Air, 6¼" R.H.	
2. LOCATION (Coordinates or Station) See Sketch		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY C.O.E		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number) NS-44		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED — UNDISTURBED —	
5. NAME OF DRILLER M. Cooney		14. TOTAL NUMBER CORE BOXES —	
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 230' while drilling	
7. THICKNESS OF OVERBURDEN 467		16. DATE HOLE STARTED 5-23-94 COMPLETED 5-24-94	
8. DEPTH DRILLED INTO ROCK 103		17. ELEVATION TOP OF HOLE N/A	
9. TOTAL DEPTH OF HOLE 570		18. TOTAL CORE RECOVERY FOR BORING — %	
		19. SIGNATURE OF INSPECTOR [illegible]	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	50		(Same As Above) Planar Cyp SILTY SHALE SOFT PARTING DENSE / VERY FINE GRAINED			6¼" Rock bit Viscosity 34 sec/qt pulldown pressure 300 psi
	51		GRAY (LgLd) occ. zone of high silt content			Add 15 gal H2O
	52		occ. siltstone lenses			Log from drillers
			silt content increased depth 530'			slow feed rate ~1' per 3 min.
	53		SHALEY SILTSTONE MODERATELY HARD/SOFT PARTING / BANDED VERY FINE GRAINED LIGHT GRAY occ. shale lenses			feed rate ~ 1 ft/5 min
	54					
	55					25 chatter
	56					End day 5-23-94 cleaned boring
	57		570	570	570	570
N80°E	58		570 - B.O.H. - No Refusal SE VIP Lot N N80°E 78' 0'			H2O level / assumed to 23' while drilling Bent Sillabel 4" PVC pipe thru bentonite Sillabel 30/40 cement backfill around outside. Air Monitoring w/ Hnu no hits. Installation diagram on pg. 7
	59		pad level			50 lbs cement 50 lbs bentonite dry mixed then mixed w/ 275 gal. H2O then drained through the bottom of the casing.
	60		941 to [illegible]			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Bannister Fed Complex | HOLE NO. NS-44

Hole No. ~~D-44~~ NS-44

DRILLING LOG	DIVISION MRD	INSTALLATION KCD	SHEET 7 OF 7 SHEETS

1. PROJECT	Bonneville Fed Compler Sizma
2. LOCATION (Coordinates or Station)	Secskatt pg 6
3. DRILLING AGENCY	C.O.E
4. HOLE NO. (As shown on drawing title and file number)	D-44 / NS-44
5. NAME OF DRILLER	M. Coony
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	46.7
8. DEPTH DRILLED INTO ROCK	10.3
9. TOTAL DEPTH OF HOLE	570
10. SIZE AND TYPE OF BIT	7 7/8 Tri-Cone Steel 6 1/4" Rock
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	MSL
12. MANUFACTURER'S DESIGNATION OF DRILL	Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 0 / UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	230' while drilling
16. DATE HOLE	STARTED 5-23-94 / COMPLETED 5-24-94
17. ELEVATION TOP OF HOLE	N/A
18. TOTAL CORE RECOVERY FOR BORING	0 %
19. SIGNATURE OF INSPECTOR	[signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			½" dia. cold patch asphalt; gravel fill; asphalt; Rock base; Hardened Grout			
			Sch 40 8" PVC surface casing			
			Bentonite pellets in annulus			
			centralizer Stainless steel 24'			
			Sch 40 4" PVC Casing 20' leads			
			perforated 163'			
			centralizer 25.8'			
			Casing Annulus			filled w/ 50% bentonite 50% cement grout ~ 50 yard
			perforated 36.3'			
			centralizer 52.8'			
			one way ball valve			
			568' bottom of Ball valve			
			570' B.O.H			
			* not to scale			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Bonneville Federal Complex | HOLE NO. D-44 / NS-44

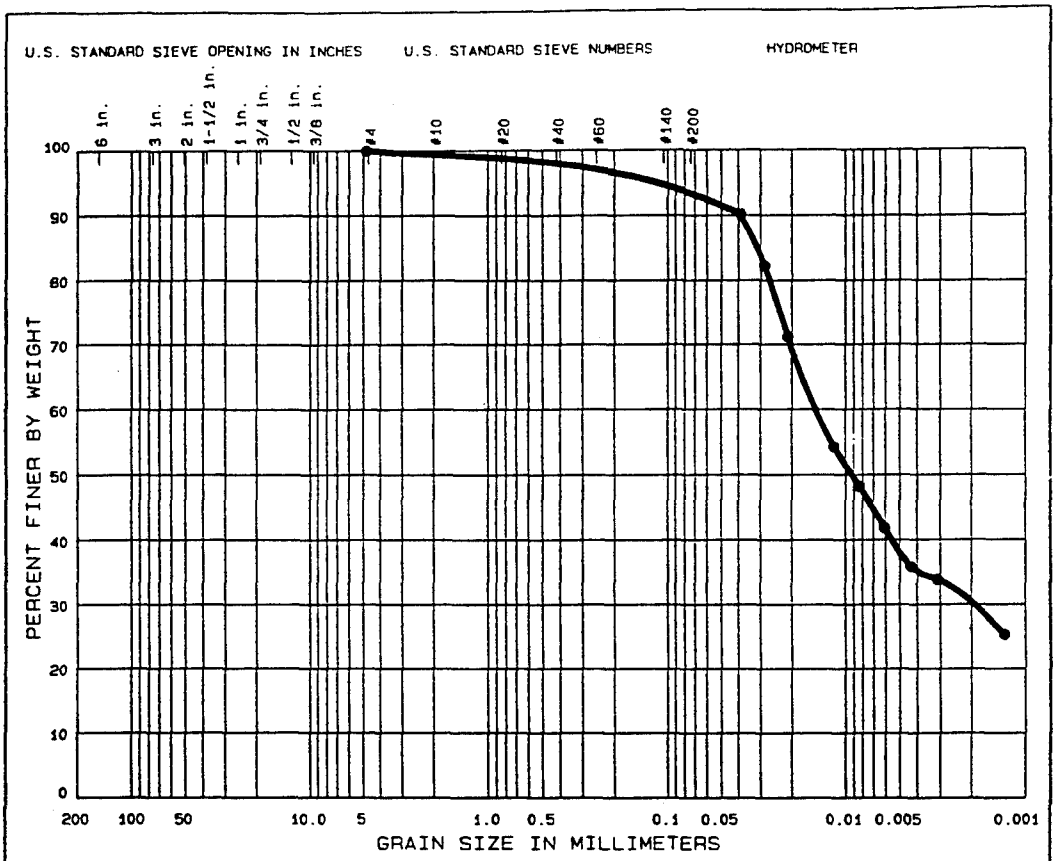
Appendix C
Laboratory Soil Tests Results

Boring D-40

Northeast Parking Lot

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban40-1
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	6.6	55.3	38.1

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-1	6.5'	25.0	54	16	38		

CLASSIFICATION

● Very Dark Gray Fat Clay, CH

Remarks:

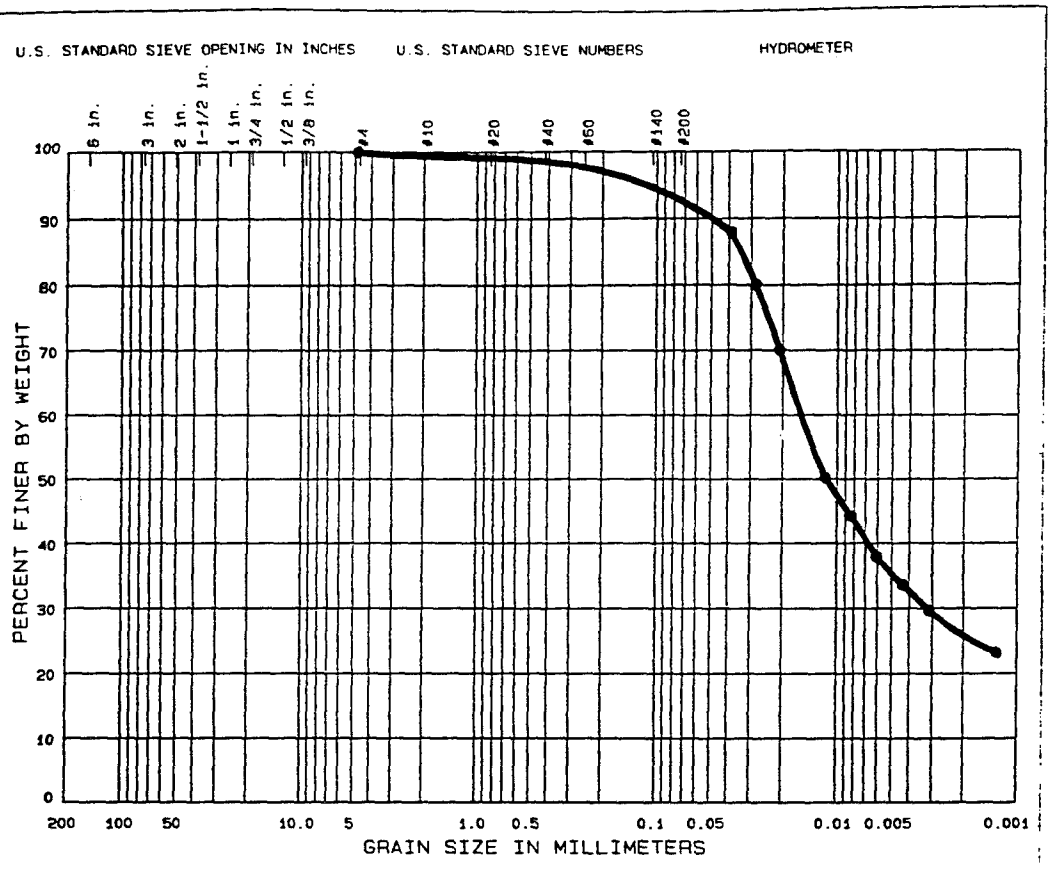
Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-40 S-1 Date 7/12/94

GRADATION CURVES Figure 1

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban40-2
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	7.2	57.5	35.3

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-2	10.9'	31.5	48	16	32		

CLASSIFICATION

● Dark Gray and Dark Brown Sandy Clay, CL

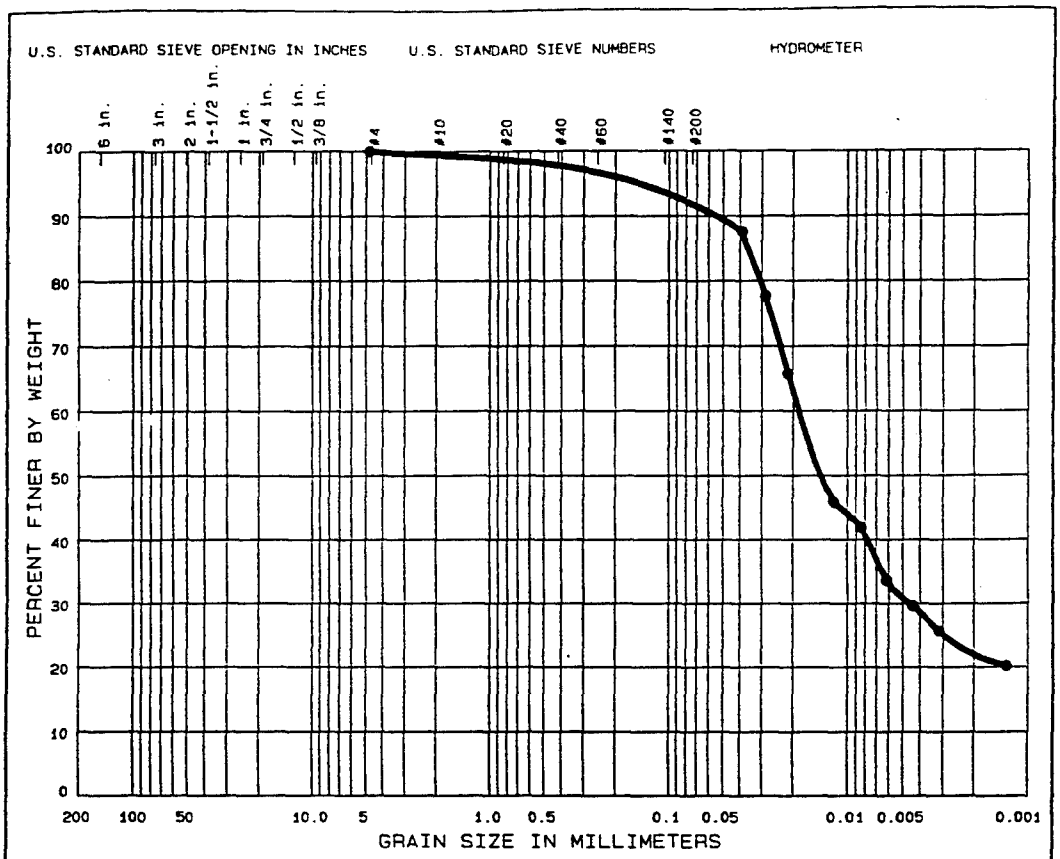
Remarks:

Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-40 S-2 Date 7/12/94

GRADATION CURVES Figure 2

W.O. No. ban40-3
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	8.2	61.0	30.8

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-3	16.5'	29.0	43	18	25		

CLASSIFICATION

● Dark Brown Sandy Clay, CL

Remarks:

Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

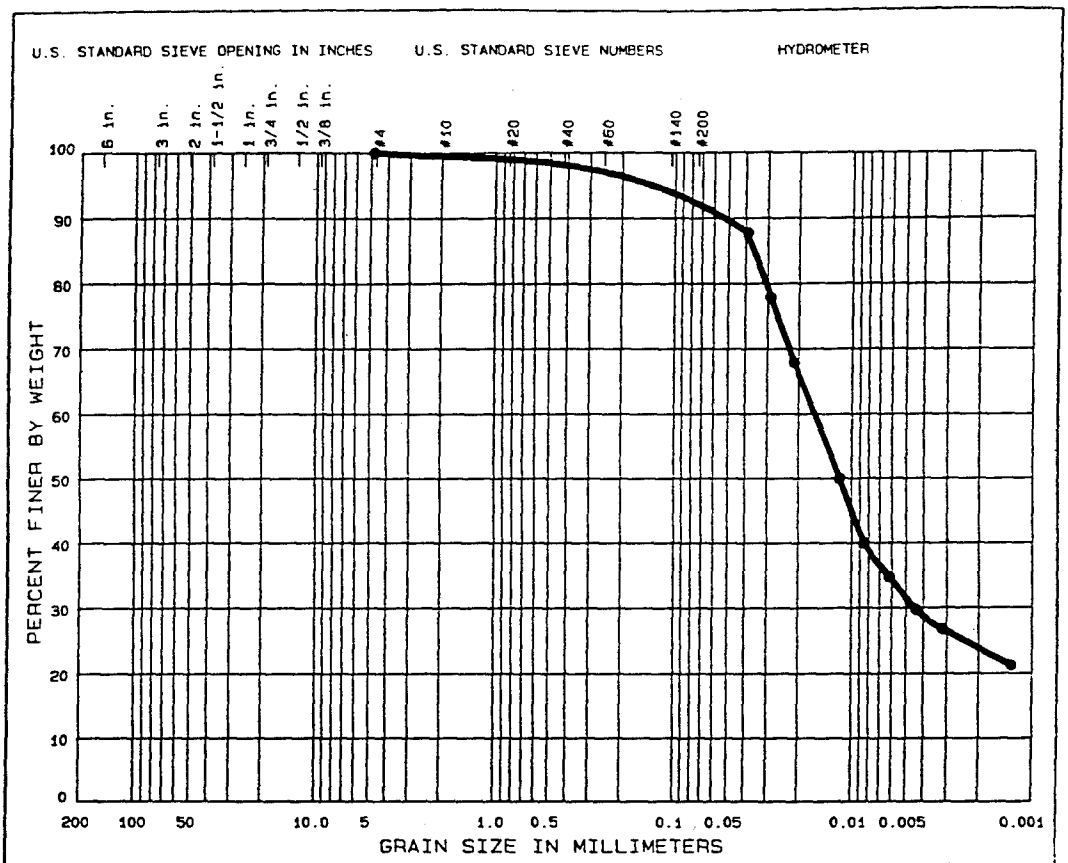
Boring No. D-40 S-3 Date 7/12/94

GRADATION CURVES Figure 3

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
1120 SOUTH 18th STREET - OMAHA, NE 68102-2586

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban40-4
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	7.8	60.6	31.6

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_c	C_u
●	S-4	21.5'	30.6	39	15	24		

CLASSIFICATION

● Very Dark Gray Lean Clay, CL

Remarks:

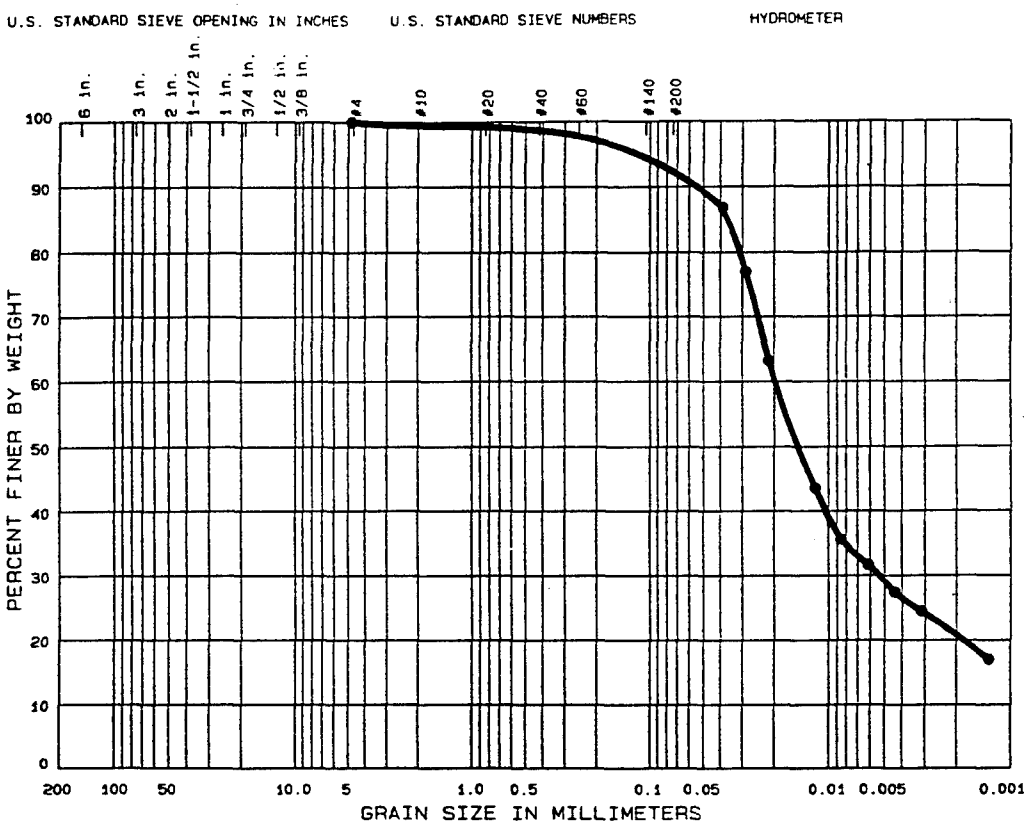
Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-40 S-4 Date 7/15/94

GRADATION CURVES Figure 4

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban40-5
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	7.7	63.2	29.1

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_c	C_u
●	S-5	26.4'	31.5	40	18	22		

CLASSIFICATION

● Very Dark Gray Lean Clay, CL

Remarks:

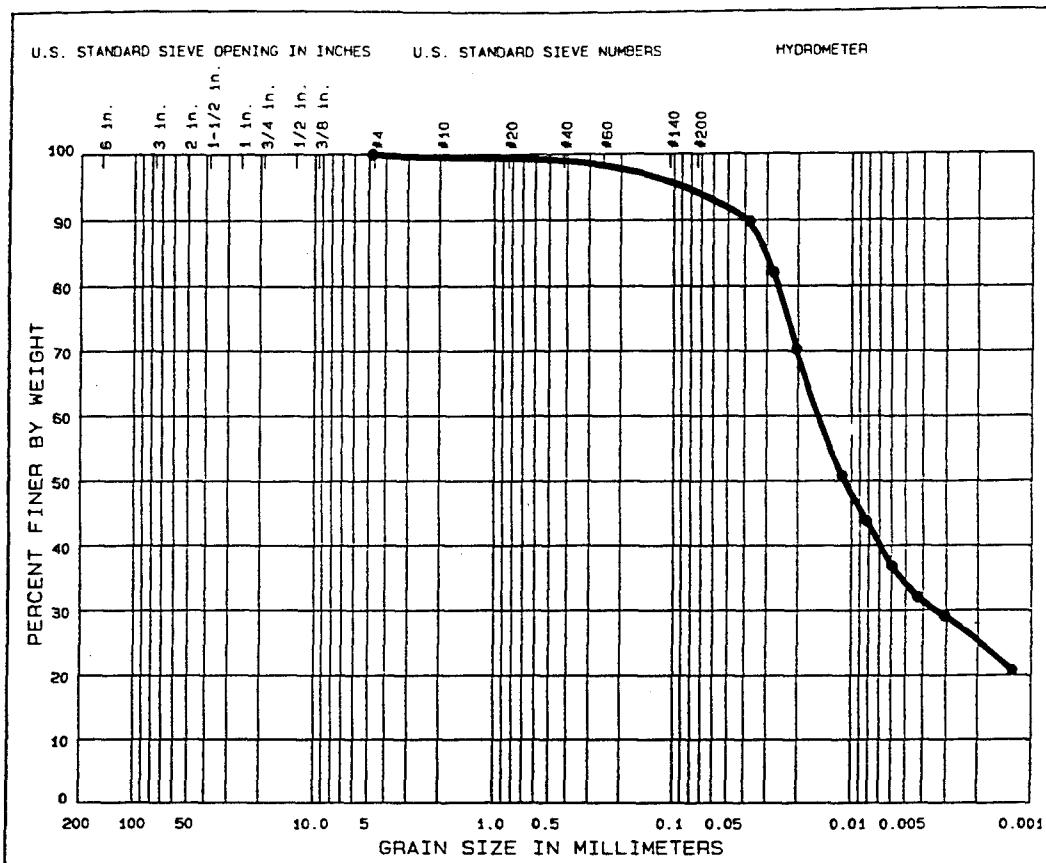
Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-40 S-5 Date 7/12/94

GRADATION CURVES Figure 5

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban40-6
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	5.8	60.1	34.1

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_c	C_u
●	S-6	31.5'	26.6	53	19	34		

CLASSIFICATION

● Mottled Gray and Rust Fat Clay with some Sand, CH

Remarks:

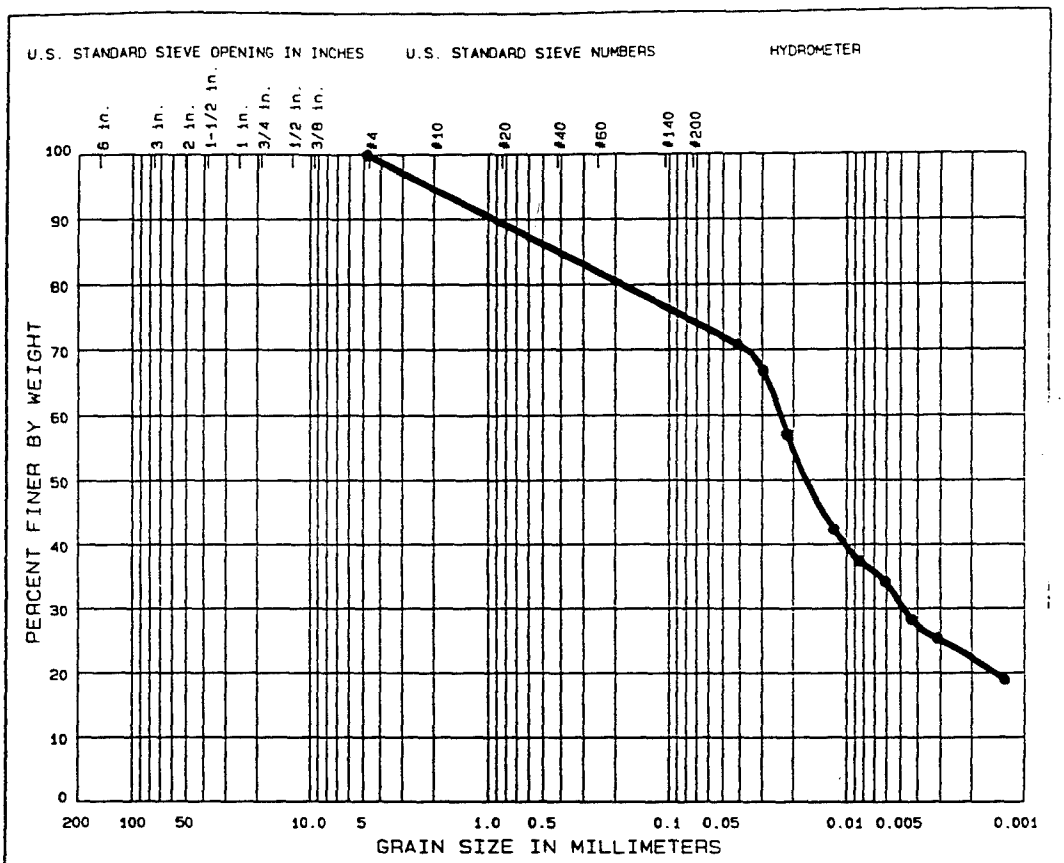
Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-40 S-6 Date 7/13/94

GRADATION CURVES Figure 6

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
1120 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban40-7
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	25.5	43.7	30.8

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-7	36.5'	24.6	41	16	25		

CLASSIFICATION

● Mottled Gray and Rust Sandy Clay, CL

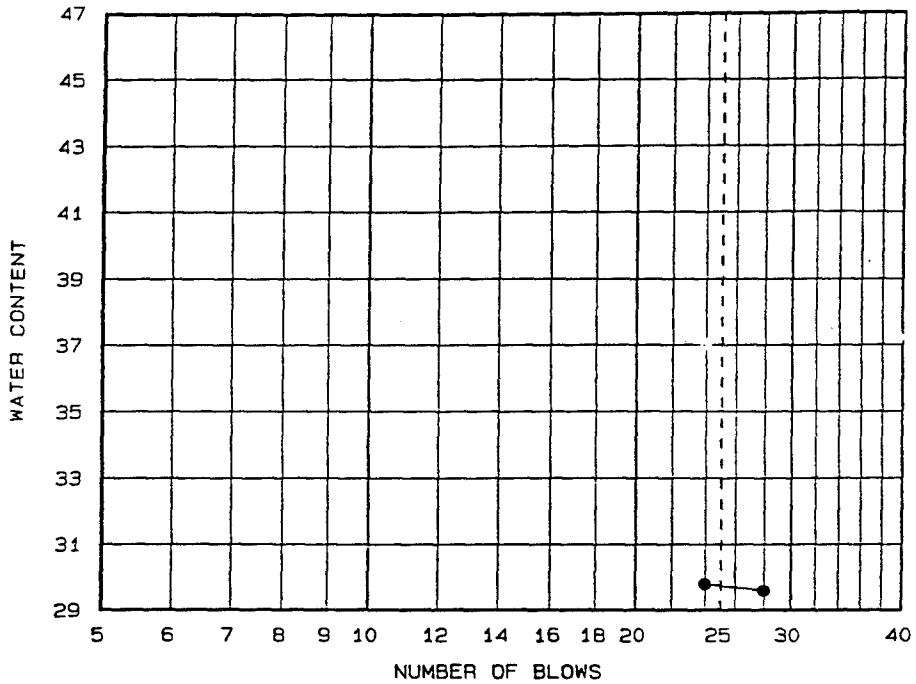
Remarks:

Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-40 S-7 Date 7/12/94

GRADATION CURVES Figure 7

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-85
●	D-40 S-8 Clayey Sandy Gravel	30	15	15		

Project No.: 2732
Project: BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Client: Kansas City District
Location: D-40 S-8

Date: 7/12/94

LIQUID AND PLASTIC LIMITS TEST REPORT

COE - MISSOURI RIVER DIV. LAB

Remarks:
Dark Brown
Specimen too small for
4-point Atterberg

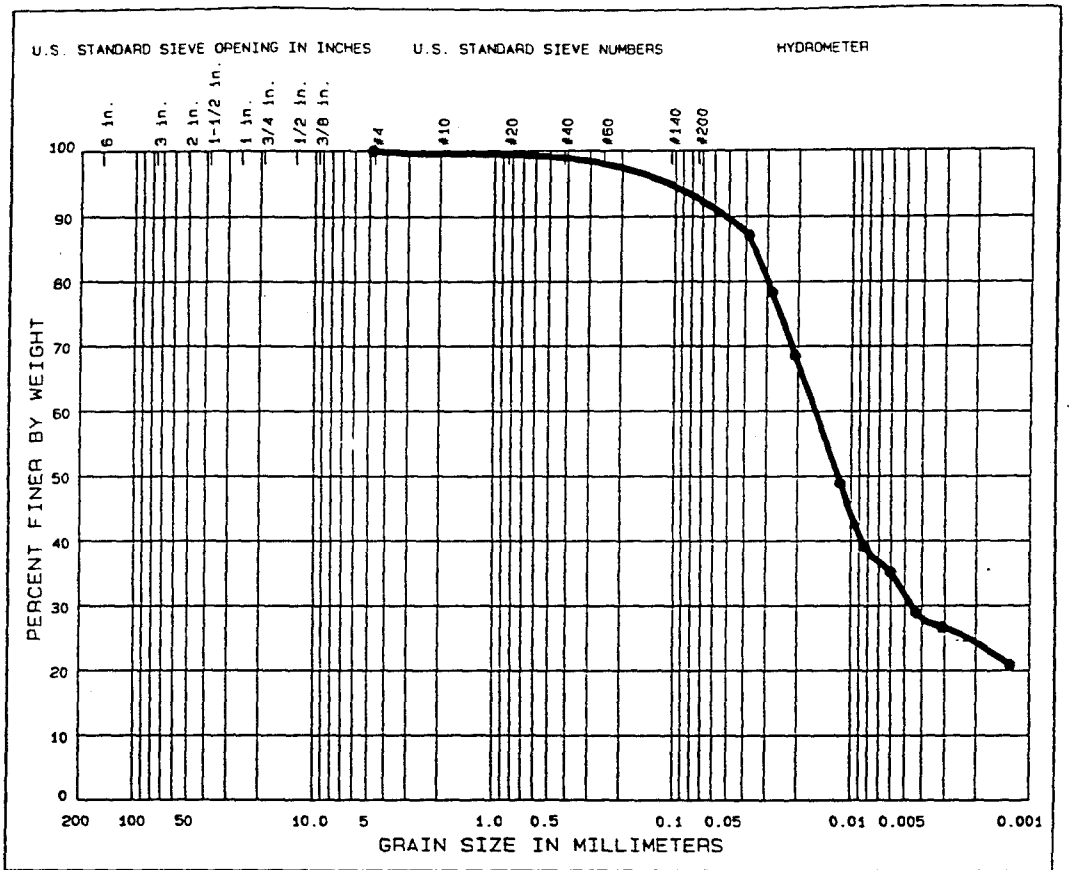
Fig. No. 8

Boring D-43

Southeast Parking Lot

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
1420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban43-1
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	7.3	61.0	31.7

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-1	6.5'	26.0	45	17	28		

CLASSIFICATION

● Dark Brown Lean Clay, CL

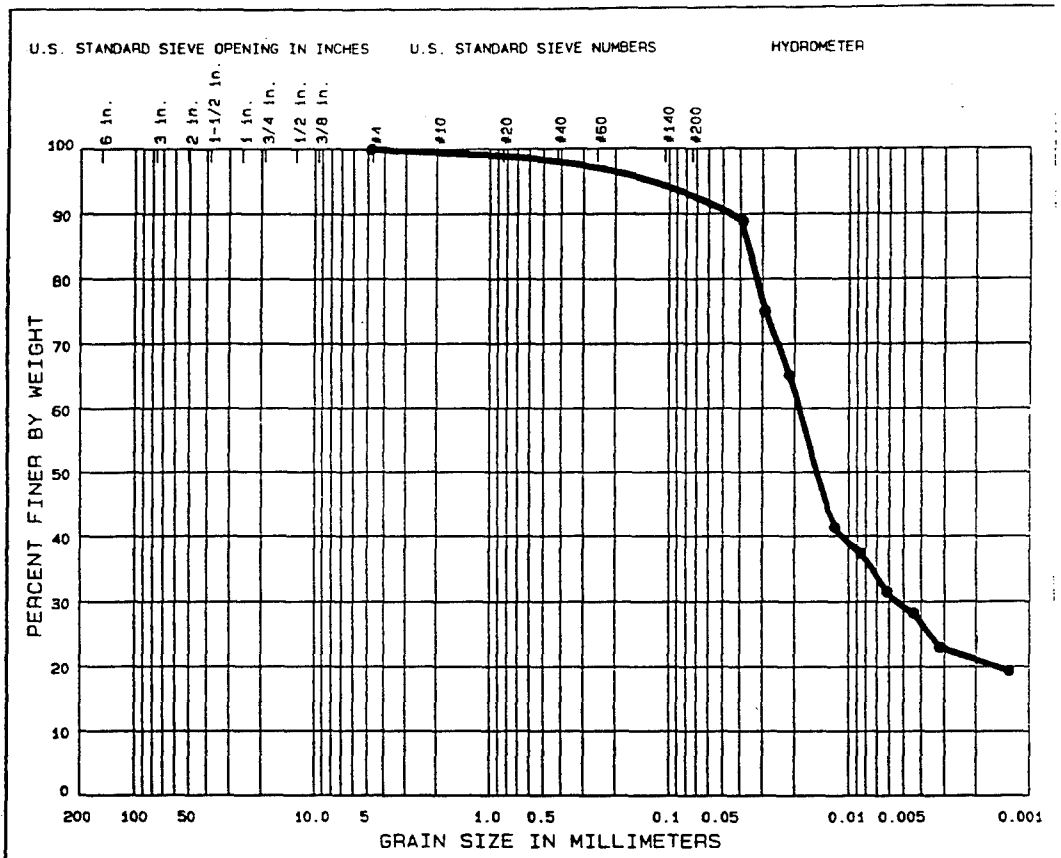
Remarks:

Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-43 S-1 Date 7/15/94

GRADATION CURVES Figure 9

W.O. No. ban43-2
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	7.2	63.5	29.3

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-2	11.5'	26.8	38	17	21		

CLASSIFICATION

● Dark Brown Lean Clay, CL

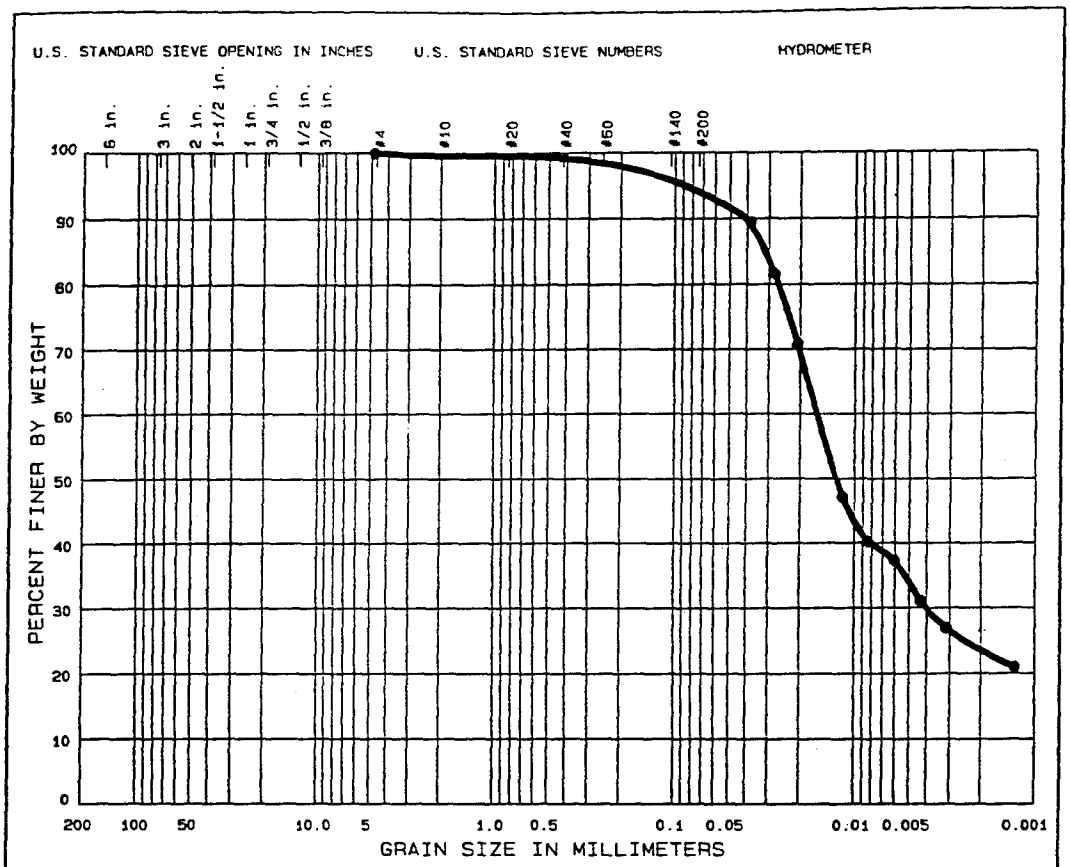
Remarks:

Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-43 S-2 Date 7/12/94

GRADATION CURVES Figure 10

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586



W.O. No. ban43-3
Req. No. KC 94-124
Contract No.

	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	5.9	60.1	34.0

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-3	16.5'	26.7	38	17	21		

CLASSIFICATION

● Dark Brown Lean Clay, CL

Remarks:

Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

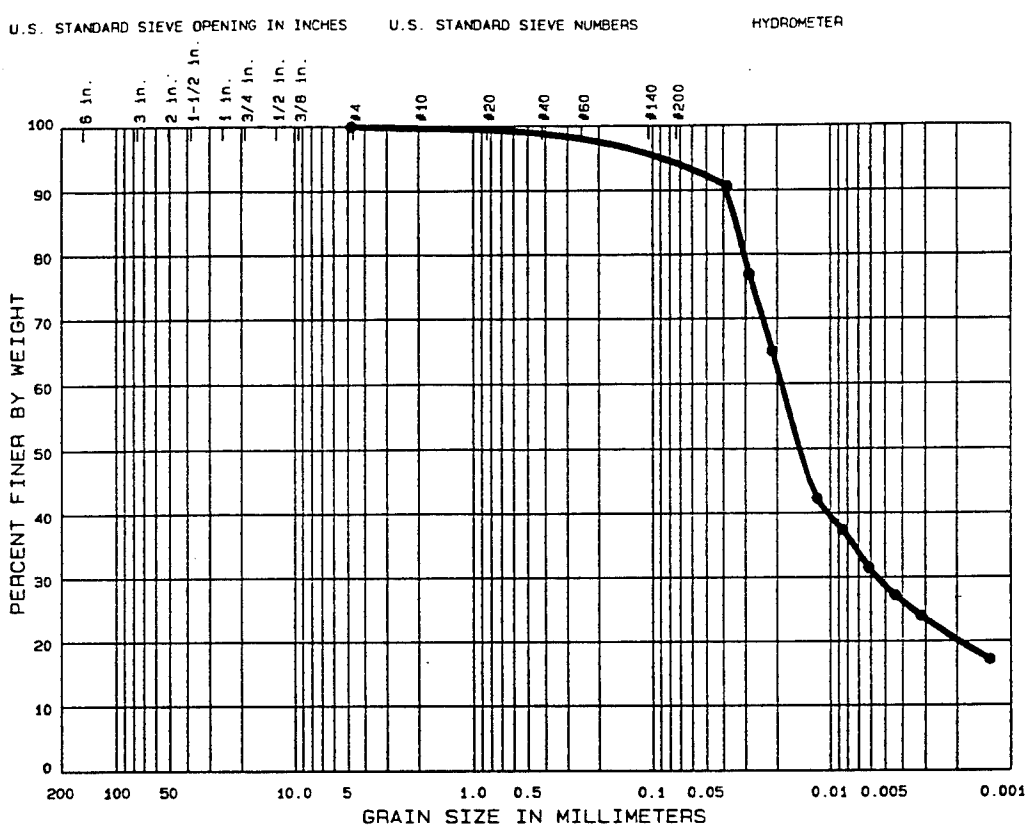
Boring No. D-43 S-3 Date 7/13/94

GRADATION CURVES Figure 11

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban43-4
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	5.7	65.6	28.7

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-4	21.5'	27.2	35	16	19		

CLASSIFICATION

● Dark Brown Lean Clay, CL

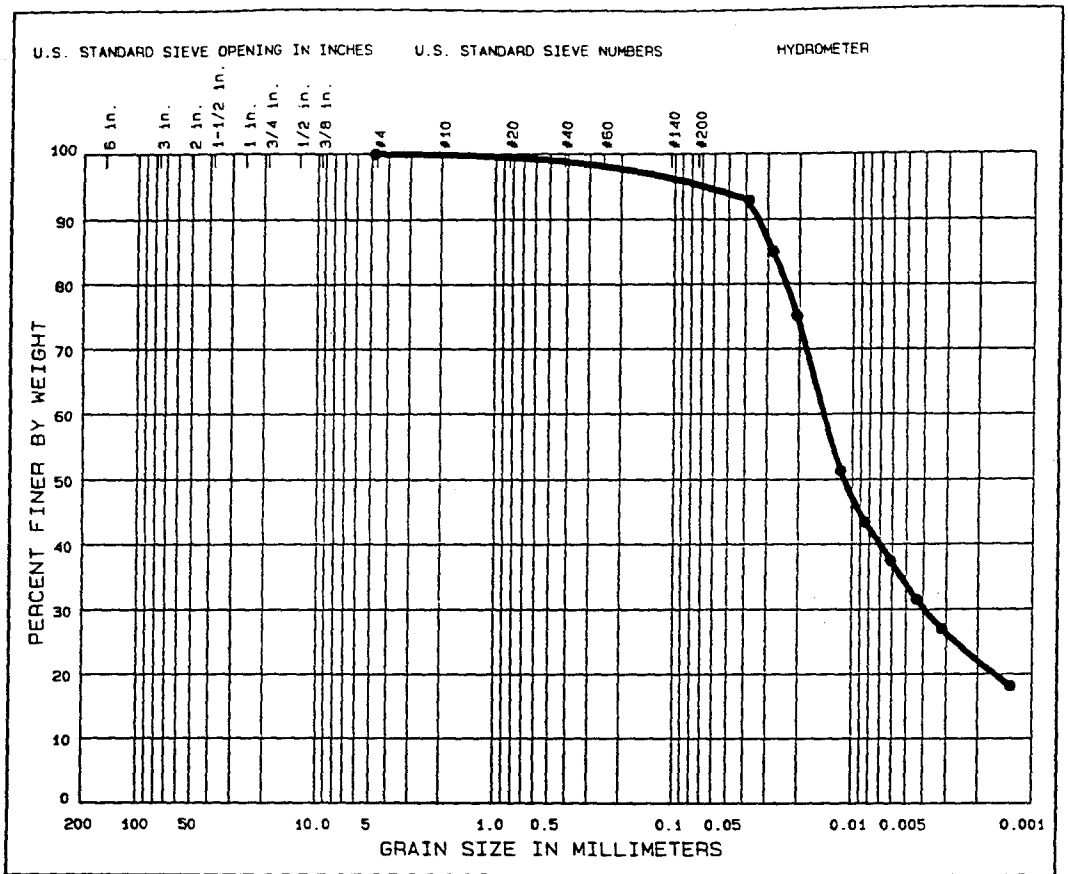
Remarks:

Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-43 S-4 Date 7/12/94

GRADATION CURVES Figure 12

W.O. No. ban43-5
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	4.7	61.4	33.9

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_c	C_u
●	S-5	26.3'	32.3	42	18	24		

CLASSIFICATION

● Dark Brown Sandy Clay, CL

Remarks:

Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

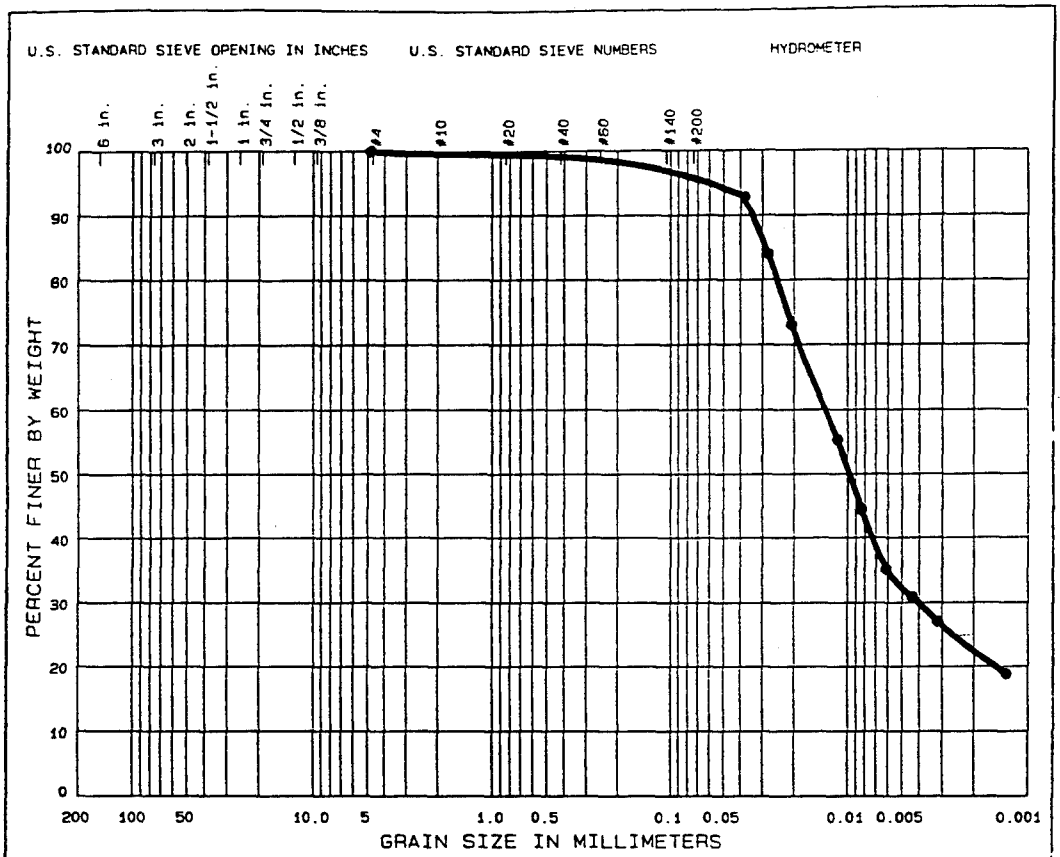
Boring No. D-43 S-5 Date 7/12/94

GRADATION CURVES Figure 13

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban43-6
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	4.2	63.5	32.3

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-6	31.5'	34.9	42	17	25		

CLASSIFICATION

● Very Dark Gray Lean Clay, CL

Remarks:

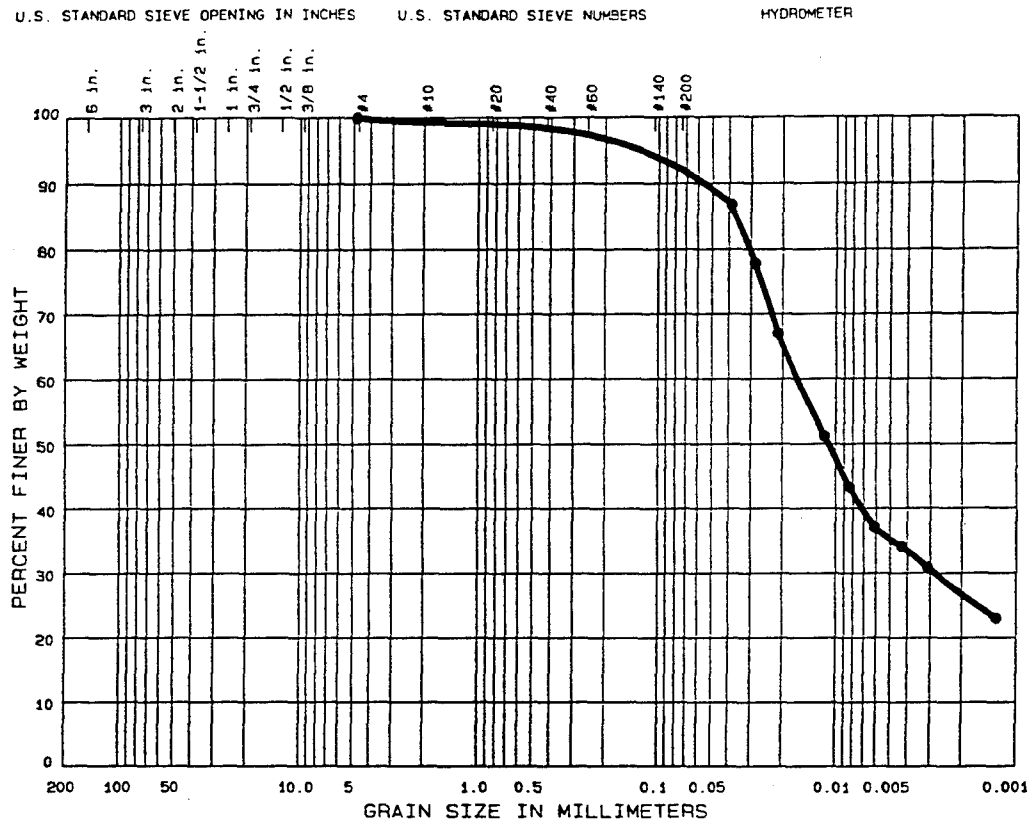
Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-43 S-6 Date 7/14/94

GRADATION CURVES Figure 14

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban43-7
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	8.0	56.8	35.2

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_c	C_u
●	S-7	36.3'	28.5	46	17	29		

CLASSIFICATION

● Very Dark Gray Lean Clay, CL

Remarks:

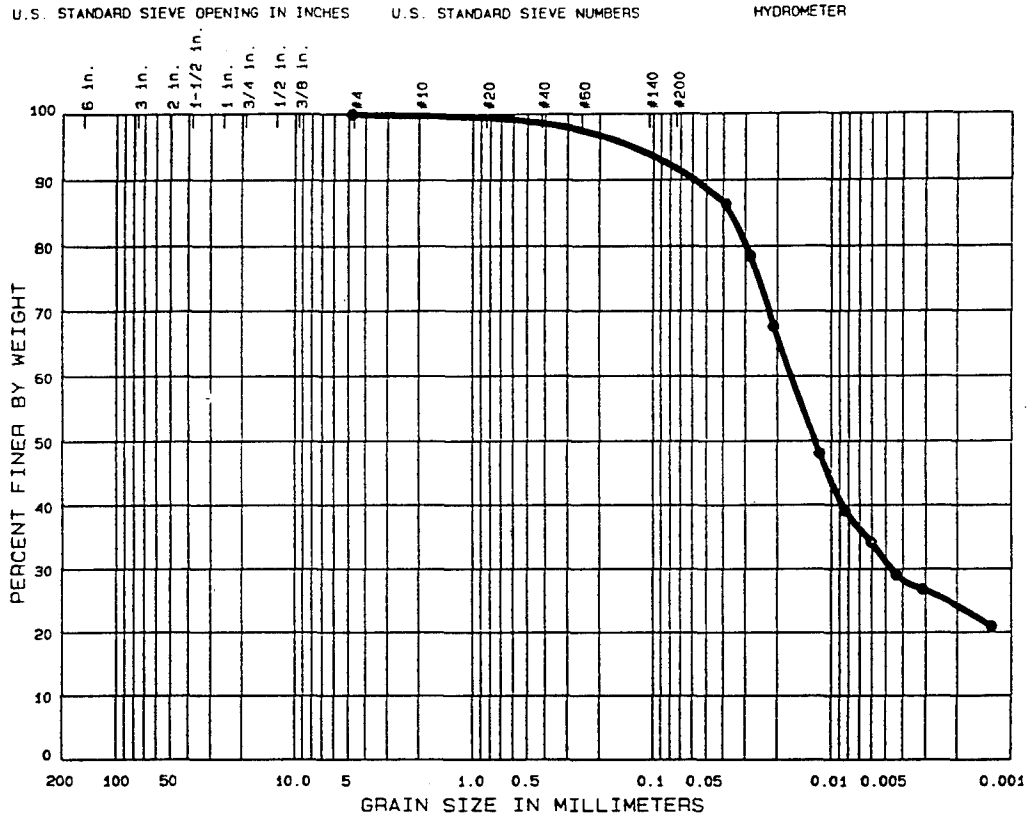
Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-43 S-7 Date 7/12/94

GRADATION CURVES Figure 15

CORPS OF ENGINEERS, MISSOURI RIVER DIVISION LAB
420 SOUTH 18th STREET - OMAHA, NE 68102-2586

W.O. No. ban43-8
Req. No. KC 94-124
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY	
●	0.0	0.0	8.2	60.6	31.2

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	S-8	41.5'	30.4	41	16	25		

CLASSIFICATION

● Very Dark Gray Lean Clay, CL

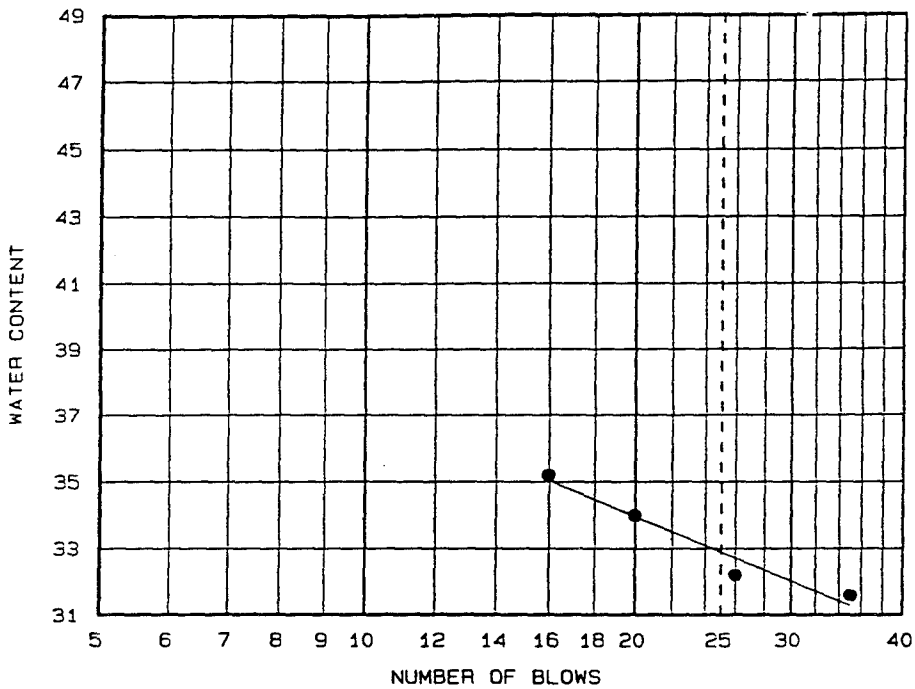
Remarks:

Project BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Lab No. 2732
Area

Boring No. D-43 S-8 Date 7/13/94

GRADATION CURVES Figure 16

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-85
●	Gravelly Sandy Clay, CL	33	16	17		

Project No.: 2732
Project: BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Client: Kansas City District
Location: D-43 S-9

Date: 7/14/94

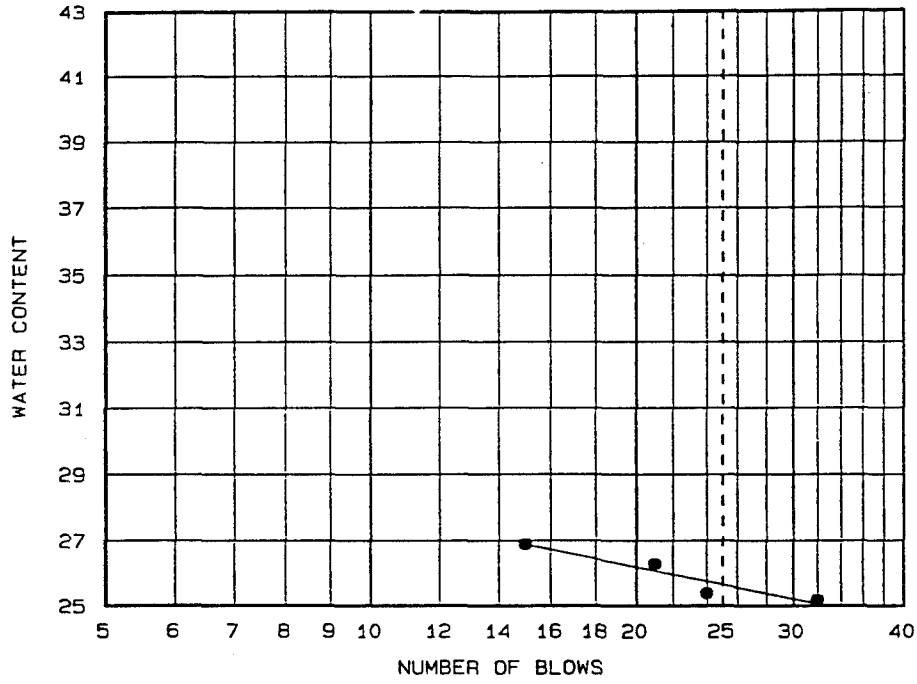
LIQUID AND PLASTIC LIMITS TEST REPORT

COE - MISSOURI RIVER DIV. LAB

Remarks:
Dark Brown
Specimen too small for needed sieve analysis
Visual classification with atterberg limits

Fig. No. 17

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-85
●	D-43 S-10 Highly Weathered Shale	26	13	13	90	CL, Lean clay

Project No.: 2732
Project: BANNISTER FEDERAL COMPLEX
Cross-Hole Seismic
Client: Kansas City District
Location: D-43 S-10

Date: 7/12/94

Remarks:

Gray

LIQUID AND PLASTIC LIMITS TEST REPORT

COE – MISSOURI RIVER DIV. LAB

Fig. No. 18

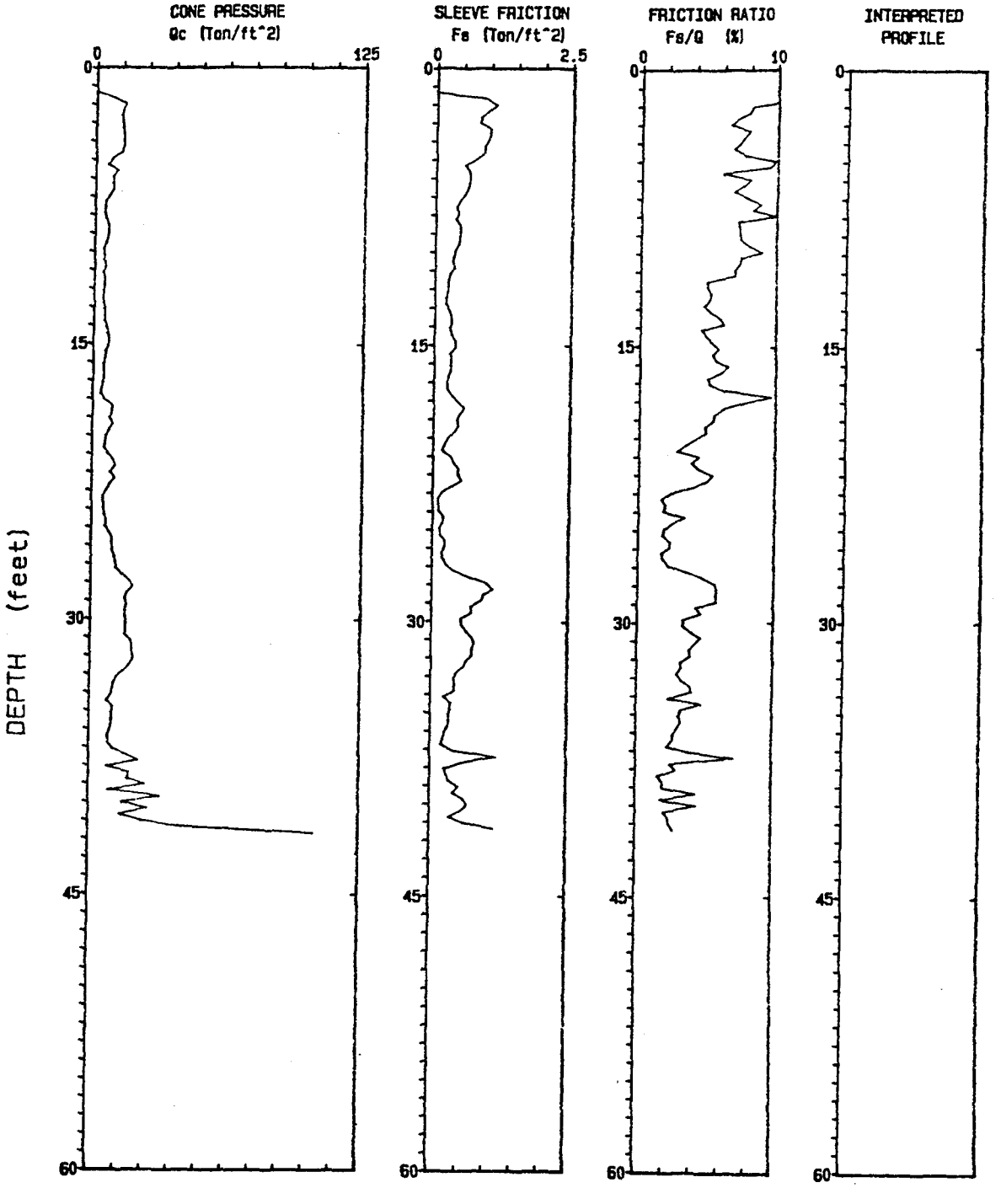
Appendix D
Seismic Cone Penetrometer Test Results

SCPT P-1

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND-91 Pg 1 / 1
Client : WES

CPT Date : 06-26-94 19:20
Location : P-1/BDC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 41.67 ft

SOUNDING DATA IN FILE SND-91 06-26-94 19:20

OPERATOR : S.VAN LOCATION : P-1/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.10	0.3	0.0	0.000	?	0.1	?
0.20	0.7	0.0	0.000	?	0.1	?
0.30	1.0	0.0	0.000	?	0.1	?
0.40	1.3	0.0	0.000	?	0.1	?
0.50	1.6	8.2	0.905	11.04	0.1	organic material
0.60	2.0	13.6	1.095	8.06	0.1	clay
0.70	2.3	12.1	0.946	7.81	0.1	clay
0.80	2.6	11.6	0.805	6.97	0.1	clay
0.90	3.0	12.1	0.783	6.45	0.1	clay
1.00	3.3	12.5	0.992	7.91	0.1	clay
1.10	3.6	13.0	0.978	7.50	0.1	clay
1.20	3.9	13.0	0.933	7.18	0.1	clay
1.30	4.3	13.0	0.878	6.73	0.1	clay
1.40	4.6	11.6	0.876	7.57	0.1	clay
1.50	4.9	7.3	0.723	9.86	0.1	clay
1.60	5.2	5.5	0.521	9.39	0.1	clay
1.70	5.6	10.2	0.604	5.90	0.1	clay
1.80	5.9	7.9	0.631	8.01	0.1	clay
1.90	6.2	8.0	0.598	7.44	0.1	clay
2.00	6.6	8.4	0.569	6.77	0.1	clay
2.10	6.9	6.5	0.507	7.83	0.1	clay
2.20	7.2	4.9	0.431	8.85	0.1	organic material
2.30	7.5	4.5	0.374	8.26	0.1	organic material
2.40	7.9	4.1	0.413	10.03	0.1	organic material
2.50	8.2	5.0	0.354	7.09	0.0	clay
2.60	8.5	6.2	0.444	7.21	0.0	clay
2.70	8.9	6.3	0.453	7.22	0.0	clay
2.80	9.2	5.9	0.439	7.38	0.0	clay
2.90	9.5	5.3	0.428	8.02	0.0	clay
3.00	9.8	4.0	0.358	8.97	0.0	organic material
3.10	10.2	4.6	0.334	7.32	0.0	organic material
3.20	10.5	4.3	0.311	7.24	0.0	clay
3.30	10.8	5.0	0.344	6.86	0.0	clay
3.40	11.2	3.9	0.270	6.88	0.0	clay
3.50	11.5	4.9	0.235	4.80	0.0	clay
3.60	11.8	4.7	0.231	4.87	0.0	clay
3.70	12.1	4.3	0.221	5.15	0.0	clay
3.80	12.5	3.9	0.196	4.98	0.0	clay
3.90	12.8	4.2	0.193	4.63	0.0	clay
4.00	13.1	5.1	0.262	5.12	0.0	clay

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.10	13.5	5.3	0.305	5.79	0.0	clay
4.20	13.8	5.1	0.310	6.08	0.0	clay
4.30	14.1	6.1	0.271	4.43	0.0	clay
4.40	14.4	6.5	0.318	4.86	0.0	clay
4.50	14.8	7.4	0.390	5.24	0.0	clay
4.60	15.1	6.9	0.396	5.74	0.0	clay
4.70	15.4	5.5	0.290	5.29	0.0	clay
4.80	15.7	5.3	0.292	5.51	0.0	clay
4.90	16.1	4.6	0.296	6.41	0.0	clay
5.00	16.4	4.9	0.288	5.87	0.0	clay
5.10	16.7	4.9	0.241	4.91	0.0	clay
5.20	17.1	4.6	0.236	5.12	0.0	clay
5.30	17.4	4.1	0.252	6.19	0.0	clay
5.40	17.7	3.5	0.342	9.70	0.0	organic material
5.50	18.0	5.8	0.446	7.64	0.0	clay
5.60	18.4	9.1	0.547	6.01	0.0	clay
5.70	18.7	8.6	0.467	5.40	0.0	clay
5.80	19.0	7.9	0.420	5.32	0.0	clay
5.90	19.4	9.6	0.453	4.73	0.0	clay
6.00	19.7	7.7	0.371	4.82	0.0	clay
6.10	20.0	6.2	0.257	4.12	0.0	clay
6.20	20.3	5.8	0.196	3.38	0.0	clay
6.30	20.7	5.5	0.154	2.78	0.0	clay
6.40	21.0	7.4	0.323	4.36	0.0	clay
6.50	21.3	9.9	0.375	3.79	0.0	clay
6.60	21.7	10.8	0.464	4.30	0.0	clay
6.70	22.0	8.4	0.448	5.34	0.0	clay
6.80	22.3	10.6	0.518	4.88	0.0	clay
6.90	22.6	8.1	0.324	4.00	0.0	clay
7.00	23.0	6.7	0.154	2.31	0.0	silty clay to clay
7.10	23.3	5.0	0.084	1.67	0.0	silty clay to clay
7.20	23.6	5.3	0.105	1.98	0.0	silty clay to clay
7.30	23.9	5.5	0.097	1.77	0.0	silty clay to clay
7.40	24.3	5.8	0.194	3.36	0.0	clay
7.50	24.6	6.6	0.159	2.39	0.0	silty clay to clay
7.60	24.9	6.5	0.121	1.88	0.0	silty clay to clay
7.70	25.3	8.2	0.146	1.77	0.0	silty clay to clay
7.80	25.6	9.9	0.232	2.34	0.0	silty clay to clay
7.90	25.9	9.7	0.218	2.24	0.0	clayey silt to silty clay
8.00	26.2	9.8	0.165	1.68	0.0	clayey silt to silty clay
8.10	26.6	10.6	0.199	1.88	0.0	clayey silt to silty clay
8.20	26.9	11.4	0.253	2.22	0.0	clayey silt to silty clay
8.30	27.2	11.7	0.412	3.51	0.0	silty clay to clay
8.40	27.6	14.4	0.674	4.68	0.0	clay
8.50	27.9	17.9	1.001	5.60	0.0	clay
8.60	28.2	19.5	1.123	5.75	0.0	clay
8.70	28.5	16.6	0.938	5.65	0.0	clay
8.80	28.9	15.7	0.902	5.76	0.0	clay
8.90	29.2	16.7	0.711	4.26	0.0	clay
9.00	29.5	15.7	0.721	4.59	0.0	clay

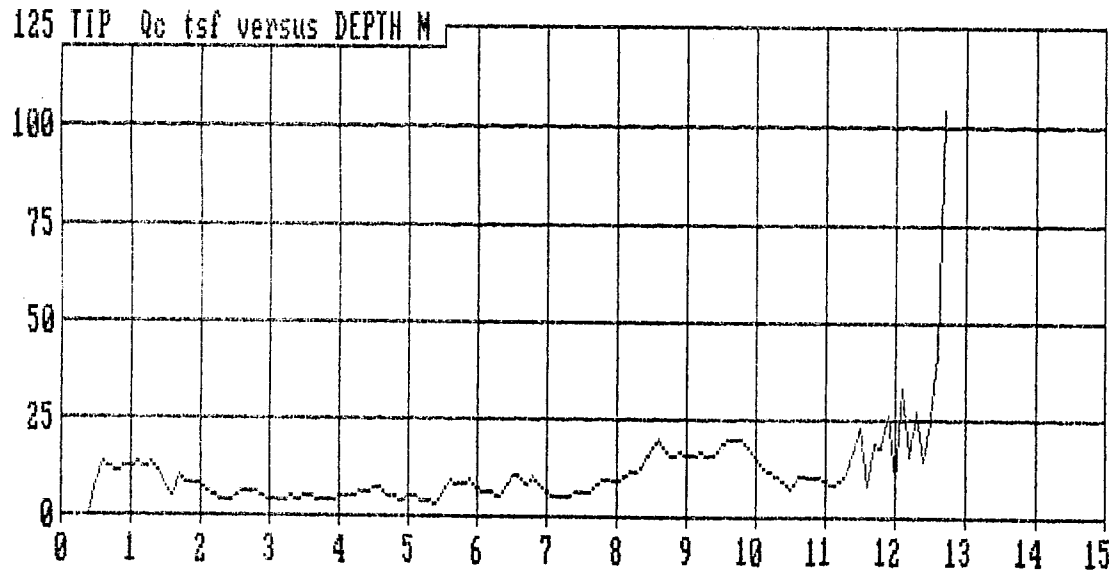
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.10	29.9	15.8	0.521	3.30	0.0	silty clay to clay
9.20	30.2	16.4	0.546	3.33	0.0	silty clay to clay
9.30	30.5	16.1	0.635	3.95	0.0	silty clay to clay
9.40	30.8	16.0	0.743	4.65	0.0	clay
9.50	31.2	19.0	0.793	4.18	0.0	clay
9.60	31.5	19.6	0.740	3.78	0.0	silty clay to clay
9.70	31.8	19.3	0.752	3.90	0.0	silty clay to clay
9.80	32.2	19.9	0.625	3.14	0.0	clayey silt to silty clay
9.90	32.5	18.0	0.576	3.20	0.0	clayey silt to silty clay
10.00	32.8	15.6	0.453	2.91	0.0	clayey silt to silty clay
10.10	33.1	12.3	0.405	3.30	0.0	silty clay to clay
10.20	33.5	11.0	0.430	3.91	0.0	clay
10.30	33.8	10.4	0.417	3.99	0.0	clay
10.40	34.1	9.8	0.229	2.33	0.0	silty clay to clay
10.50	34.4	7.8	0.372	4.77	0.0	clay
10.60	34.8	10.8	0.348	3.22	0.0	clay
10.70	35.1	10.3	0.317	3.07	0.0	silty clay to clay
10.80	35.4	10.2	0.331	3.25	0.0	silty clay to clay
10.90	35.8	10.0	0.295	2.94	0.0	silty clay to clay
11.00	36.1	9.2	0.245	2.65	0.0	silty clay to clay
11.10	36.4	8.3	0.218	2.63	0.0	silty clay to clay
11.20	36.7	8.9	0.204	2.28	0.0	silty clay to clay
11.30	37.1	11.4	0.445	3.89	0.0	clay
11.40	37.4	16.8	1.205	7.18	0.0	clay
11.50	37.7	22.9	0.573	2.51	0.0	silty clay to clay
11.60	38.1	8.5	0.247	2.91	0.0	clayey silt to silty clay
11.70	38.4	18.3	0.295	1.61	0.0	clayey silt to silty clay
11.80	38.7	17.8	0.354	1.98	0.0	sandy silt to clayey silt
11.90	39.0	26.2	0.525	2.00	0.0	clayey silt to silty clay
12.00	39.4	9.5	0.417	4.41	0.0	clayey silt to silty clay
12.10	39.7	33.3	0.610	1.83	0.0	clayey silt to silty clay
12.20	40.0	15.5	0.692	4.45	0.0	clayey silt to silty clay
12.30	40.4	27.3	0.560	2.05	0.0	clayey silt to silty clay
12.40	40.7	14.5	0.350	2.41	0.0	clayey silt to silty clay
12.50	41.0	24.6	0.614	2.49	0.0	clayey silt to silty clay
12.60	41.3	42.3	1.172	2.77	0.0	?
12.70	41.7	104.6	?	?	0.0	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

SOUNDING DATA IN FILE SND-91 06-26-94 19:20
OPERATOR : S.VAN LOCATION : P-1/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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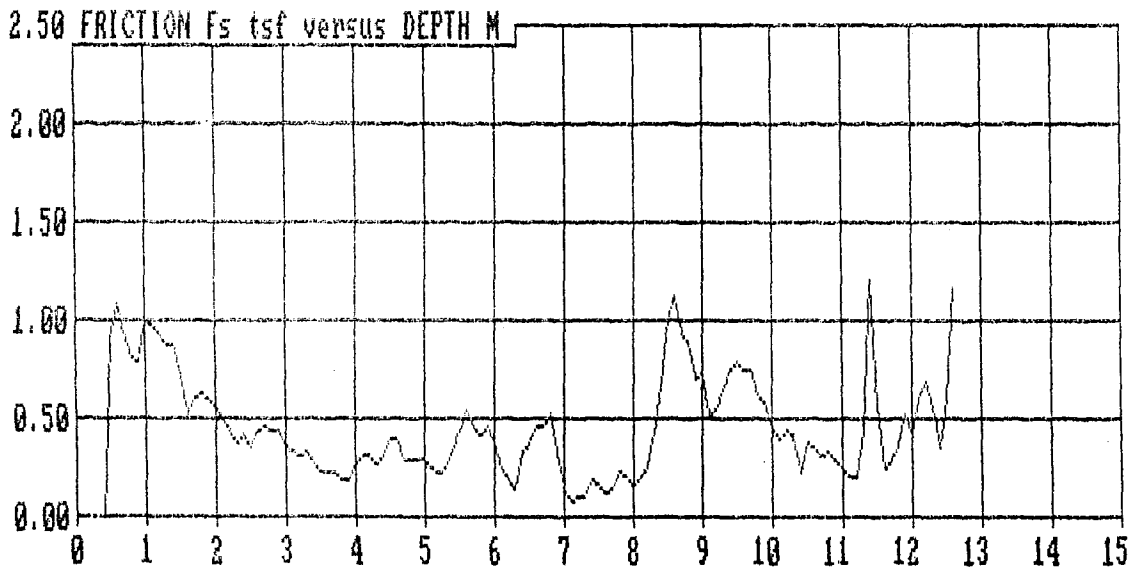
OPERATOR : S.VAN LOCATION : P-1/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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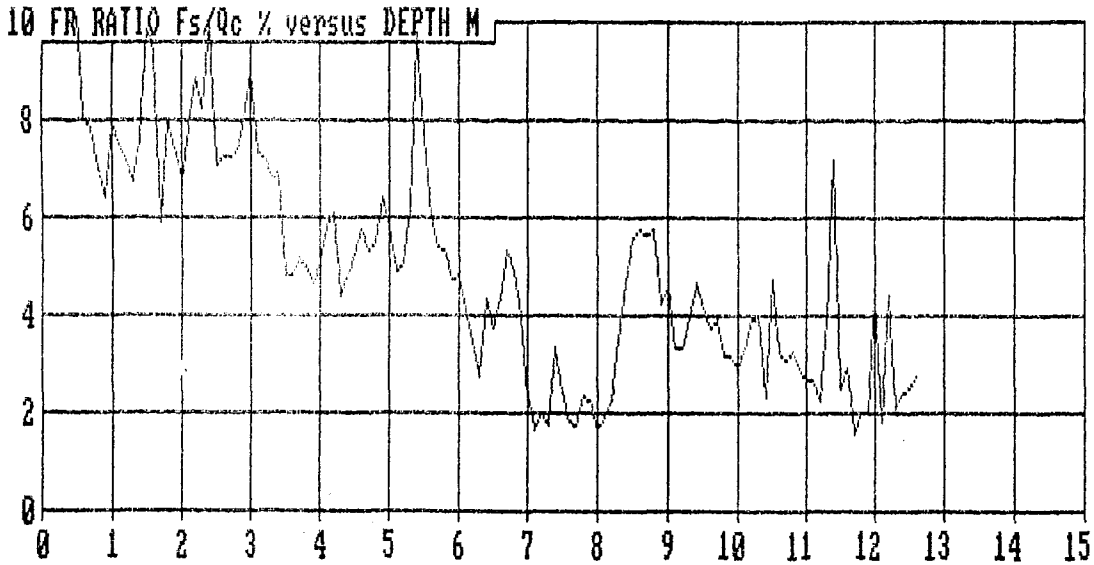
OPERATOR : S.VAN LOCATION : P-1/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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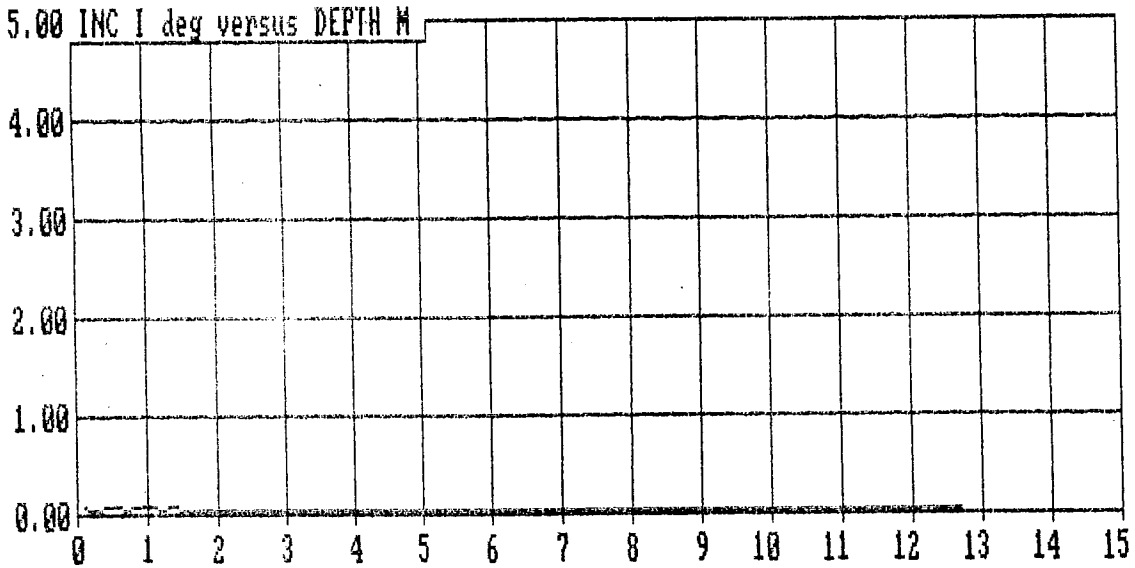
OPERATOR : S.VAN LOCATION : P-1/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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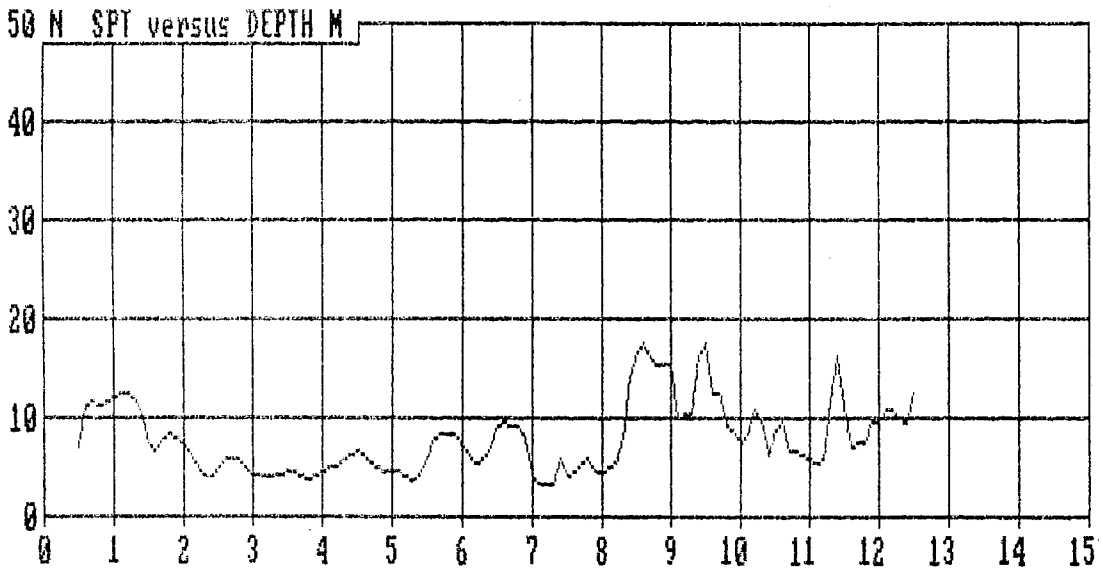
OPERATOR : S.VAN LOCATION : P-1/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

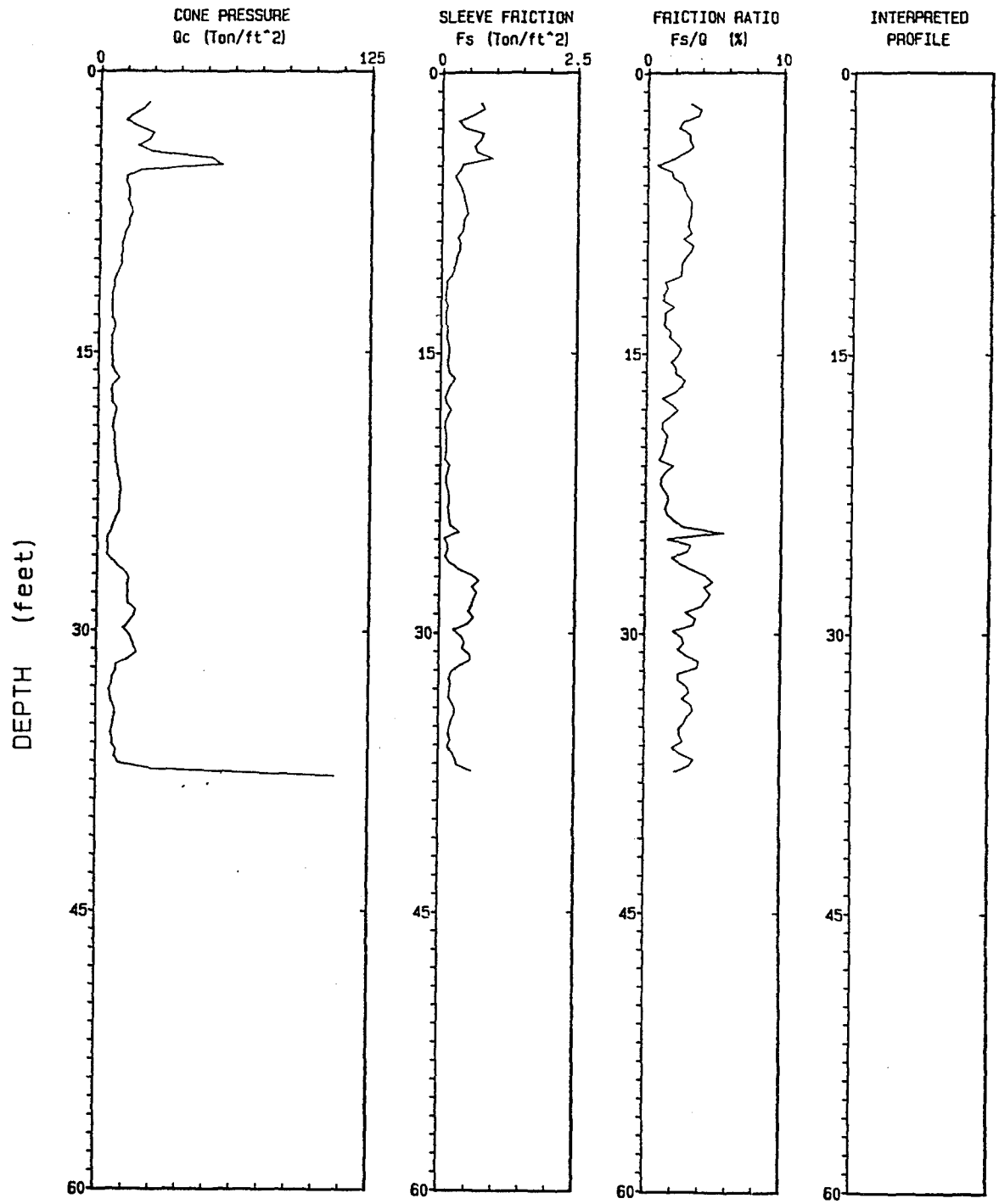


SCPT P-2

Vandeheey Soil Expl.

Operator : S.VAN
Sounding : SND102 Pg 1 / 1
Client : WES

CPT Date : 06-29-94 19:48
Location : P-2/BFC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 37.73 ft

SOUNDING DATA IN FILE SND102 06-29-94 19:48

OPERATOR : S.VAN LOCATION : P-2/BFC-KC M0

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.50	1.6	22.5	0.715	3.18	0.1	?
0.60	2.0	19.7	0.772	3.91	0.1	silty clay to clay
0.70	2.3	14.8	0.543	3.67	0.1	silty clay to clay
0.80	2.6	11.7	0.296	2.52	0.1	clayey silt to silty clay
0.90	3.0	17.6	0.395	2.25	0.1	clayey silt to silty clay
1.00	3.3	24.6	0.766	3.11	0.1	clayey silt to silty clay
1.10	3.6	22.8	0.704	3.09	0.1	clayey silt to silty clay
1.20	3.9	17.6	0.589	3.35	0.1	clayey silt to silty clay
1.30	4.3	23.5	0.637	2.71	0.1	sandy silt to clayey silt
1.40	4.6	51.5	0.920	1.79	0.1	silty sand to sandy silt
1.50	4.9	56.6	0.374	0.66	0.1	silty sand to sandy silt
1.60	5.2	18.4	0.321	1.75	0.1	sandy silt to clayey silt
1.70	5.6	12.1	0.227	1.87	0.1	clayey silt to silty clay
1.80	5.9	11.7	0.295	2.53	0.1	clayey silt to silty clay
1.90	6.2	13.2	0.359	2.71	0.1	clayey silt to silty clay
2.00	6.6	13.7	0.403	2.94	0.1	silty clay to clay
2.10	6.9	12.8	0.419	3.27	0.1	silty clay to clay
2.20	7.2	14.2	0.450	3.17	0.1	silty clay to clay
2.30	7.5	14.6	0.469	3.21	0.1	silty clay to clay
2.40	7.9	13.2	0.399	3.02	0.1	silty clay to clay
2.50	8.2	13.2	0.392	2.96	0.1	silty clay to clay
2.60	8.5	11.5	0.371	3.23	0.1	silty clay to clay
2.70	8.9	10.8	0.283	2.61	0.1	silty clay to clay
2.80	9.2	9.9	0.340	3.42	0.1	silty clay to clay
2.90	9.5	10.6	0.338	3.18	0.1	silty clay to clay
3.00	9.8	9.8	0.274	2.79	0.1	silty clay to clay
3.10	10.2	10.2	0.258	2.52	0.1	silty clay to clay
3.20	10.5	8.6	0.213	2.49	0.1	silty clay to clay
3.30	10.8	7.6	0.188	2.47	0.1	silty clay to clay
3.40	11.2	6.6	0.085	1.28	0.1	silty clay to clay
3.50	11.5	6.6	0.100	1.51	0.1	sensitive fine grained
3.60	11.8	5.7	0.067	1.18	0.1	sensitive fine grained
3.70	12.1	6.1	0.072	1.19	0.1	sensitive fine grained
3.80	12.5	6.2	0.126	2.02	0.2	silty clay to clay
3.90	12.8	6.3	0.082	1.30	0.1	sensitive fine grained
4.00	13.1	6.3	0.086	1.36	0.1	sensitive fine grained
4.10	13.5	7.4	0.092	1.24	0.1	clayey silt to silty clay
4.20	13.8	7.1	0.125	1.76	0.1	silty clay to clay
4.30	14.1	5.7	0.095	1.65	0.1	silty clay to clay
4.40	14.4	6.0	0.131	2.19	0.1	silty clay to clay

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.50	14.8	6.0	0.150	2.51	0.1	silty clay to clay
4.60	15.1	6.0	0.134	2.23	0.1	silty clay to clay
4.70	15.4	6.5	0.115	1.79	0.1	silty clay to clay
4.80	15.7	6.5	0.140	2.16	0.1	silty clay to clay
4.90	16.1	7.7	0.168	2.18	0.1	silty clay to clay
5.00	16.4	9.4	0.264	2.82	0.1	silty clay to clay
5.10	16.7	6.5	0.169	2.59	0.1	silty clay to clay
5.20	17.1	5.8	0.119	2.04	0.1	silty clay to clay
5.30	17.4	6.5	0.074	1.14	0.1	sensitive fine grained
5.40	17.7	6.2	0.115	1.84	0.1	silty clay to clay
5.50	18.0	8.3	0.193	2.32	0.1	silty clay to clay
5.60	18.4	7.7	0.133	1.74	0.1	clayey silt to silty clay
5.70	18.7	7.6	0.080	1.14	0.1	sensitive fine grained
5.80	19.0	6.6	0.079	1.19	0.1	sensitive fine grained
5.90	19.4	7.3	0.113	1.56	0.1	clayey silt to silty clay
6.00	19.7	7.4	0.106	1.44	0.1	clayey silt to silty clay
6.10	20.0	7.6	0.098	1.28	0.1	clayey silt to silty clay
6.20	20.3	7.9	0.092	1.16	0.1	clayey silt to silty clay
6.30	20.7	7.9	0.070	0.89	0.1	clayey silt to silty clay
6.40	21.0	8.2	0.167	2.03	0.1	clayey silt to silty clay
6.50	21.3	9.2	0.130	1.42	0.1	clayey silt to silty clay
6.60	21.7	9.2	0.101	1.10	0.1	clayey silt to silty clay
6.70	22.0	10.0	0.105	1.05	0.1	clayey silt to silty clay
6.80	22.3	10.5	0.140	1.34	0.1	clayey silt to silty clay
6.90	22.6	9.7	0.164	1.69	0.1	clayey silt to silty clay
7.00	23.0	10.0	0.154	1.55	0.1	clayey silt to silty clay
7.10	23.3	9.4	0.129	1.37	0.1	clayey silt to silty clay
7.20	23.6	9.6	0.155	1.61	0.1	clayey silt to silty clay
7.30	23.9	8.0	0.170	2.12	0.1	silty clay to clay
7.40	24.3	7.1	0.200	2.82	0.1	clay
7.50	24.6	6.2	0.361	5.82	0.1	clay
7.60	24.9	4.5	0.074	1.64	0.1	clay
7.70	25.3	4.3	0.143	3.35	0.1	clay
7.80	25.6	4.3	0.134	3.11	0.1	clay
7.90	25.9	4.6	0.089	1.94	0.1	clay
8.00	26.2	7.1	0.179	2.51	0.1	silty clay to clay
8.10	26.6	9.6	0.328	3.43	0.1	clay
8.20	26.9	13.0	0.579	4.44	0.1	clay
8.30	27.2	14.5	0.729	5.02	0.1	clay
8.40	27.6	13.6	0.593	4.36	0.1	clay
8.50	27.9	14.2	0.687	4.84	0.1	clay
8.60	28.2	13.8	0.617	4.48	0.1	clay
8.70	28.5	14.2	0.597	4.21	0.1	silty clay to clay
8.80	28.9	17.6	0.523	2.97	0.1	silty clay to clay
8.90	29.2	16.7	0.622	3.73	0.1	silty clay to clay
9.00	29.5	14.3	0.505	3.53	0.1	silty clay to clay
9.10	29.9	12.1	0.252	2.08	0.2	clayey silt to silty clay
9.20	30.2	14.8	0.406	2.74	0.2	clayey silt to silty clay
9.30	30.5	16.1	0.462	2.88	0.2	clayey silt to silty clay
9.40	30.8	17.1	0.416	2.43	0.2	clayey silt to silty clay

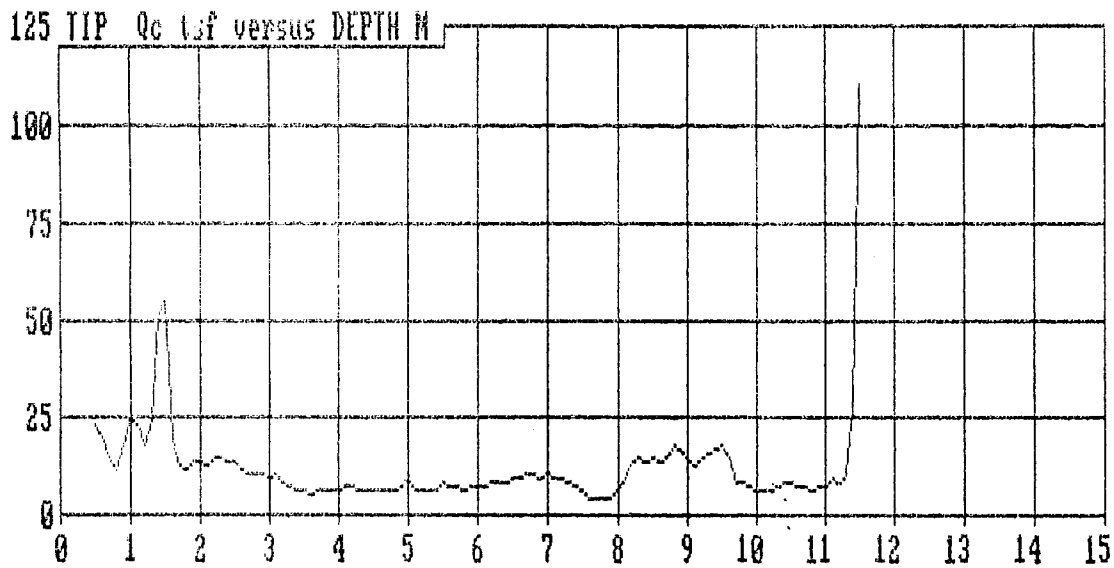
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.50	31.2	18.2	0.560	3.08	0.2	clayey silt to silty clay
9.60	31.5	14.1	0.571	4.05	0.2	silty clay to clay
9.70	31.8	8.6	0.332	3.87	0.2	clay
9.80	32.2	8.5	0.205	2.41	0.2	silty clay to clay
9.90	32.5	6.9	0.169	2.45	0.2	silty clay to clay
10.00	32.8	6.7	0.210	3.14	0.2	clay
10.10	33.1	5.8	0.193	3.32	0.2	clay
10.20	33.5	6.4	0.177	2.75	0.2	clay
10.30	33.8	7.0	0.241	3.44	0.2	clay
10.40	34.1	8.2	0.285	3.59	0.2	clay
10.50	34.4	8.8	0.276	3.14	0.2	clay
10.60	34.8	7.6	0.223	2.93	0.2	silty clay to clay
10.70	35.1	7.2	0.181	2.50	0.2	silty clay to clay
10.80	35.4	6.5	0.166	2.57	0.2	silty clay to clay
10.90	35.8	7.4	0.205	2.82	0.2	silty clay to clay
11.00	36.1	7.2	0.144	2.00	0.2	silty clay to clay
11.10	36.4	9.1	0.243	2.68	0.2	silty clay to clay
11.20	36.7	8.5	0.309	3.65	0.2	clay
11.30	37.1	10.4	0.341	3.28	0.2	clayey silt to silty clay
11.40	37.4	26.7	0.601	2.25	0.2	?
11.50	37.7	109.9	?	?	0.2	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 = sliding data average

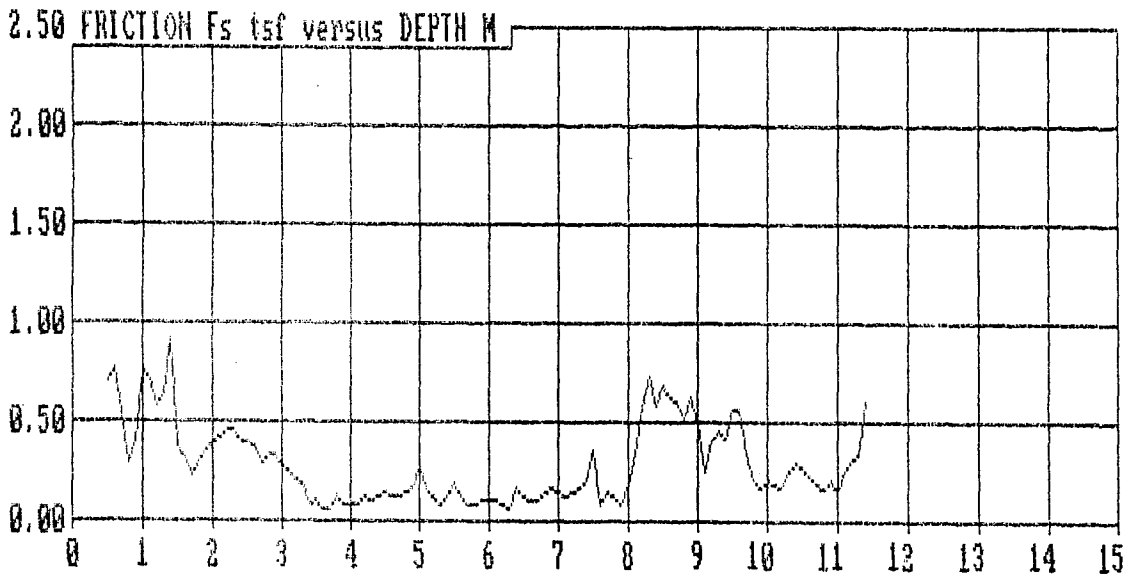
SOUNDING DATA IN FILE SND102 06-29-94 19:48
OPERATOR : S.VAN LOCATION : P-2/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



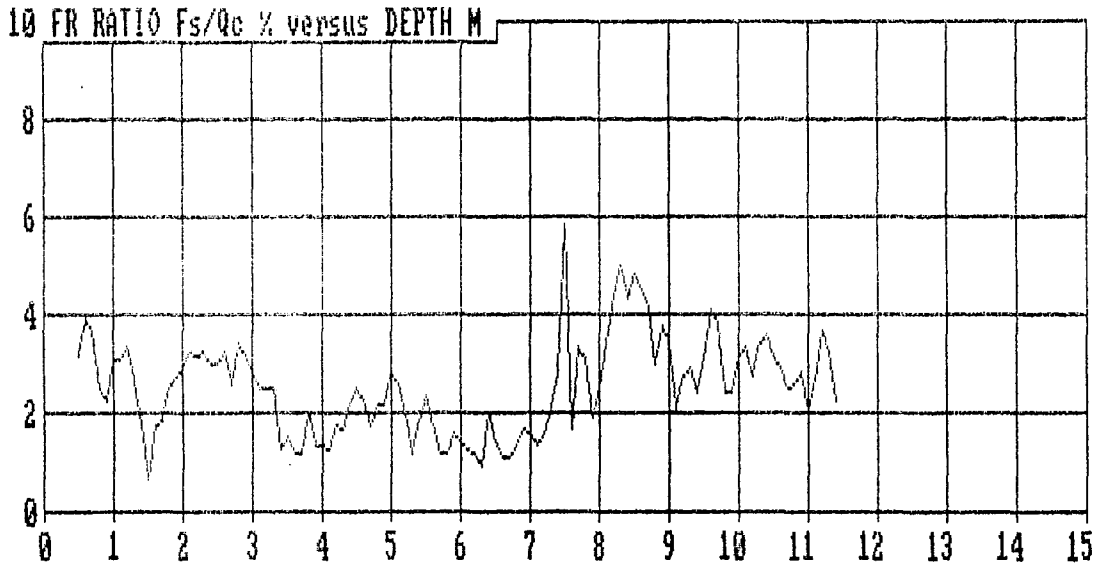
SOUNDING DATA IN FILE SND102 06-29-94 19:48
OPERATOR : S.VAN LOCATION : P-2/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND102 06-29-94 19:48
OPERATOR : S.VAN LOCATION : P-2/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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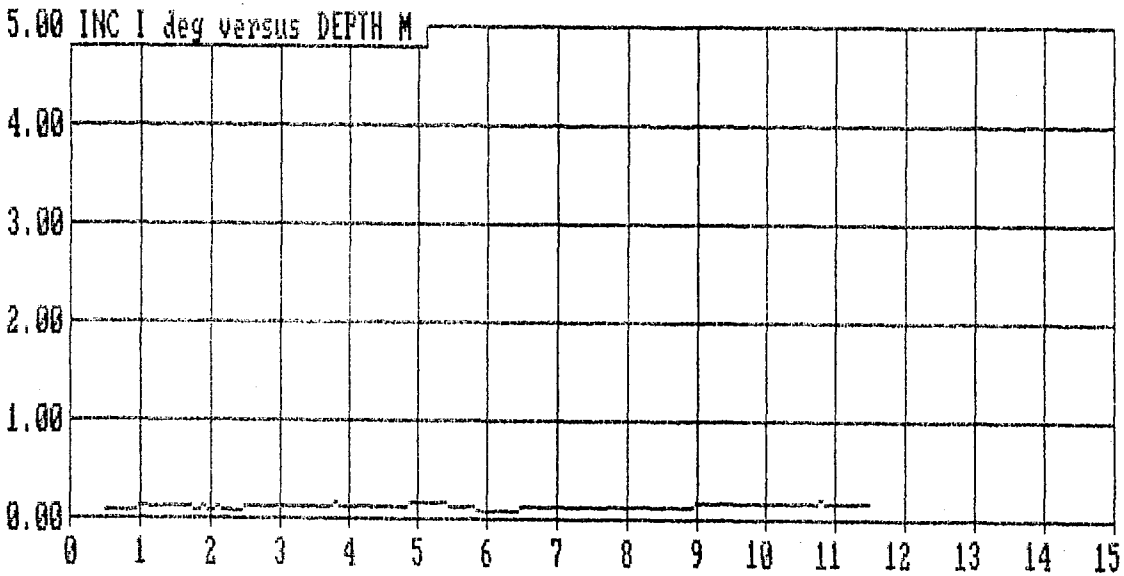
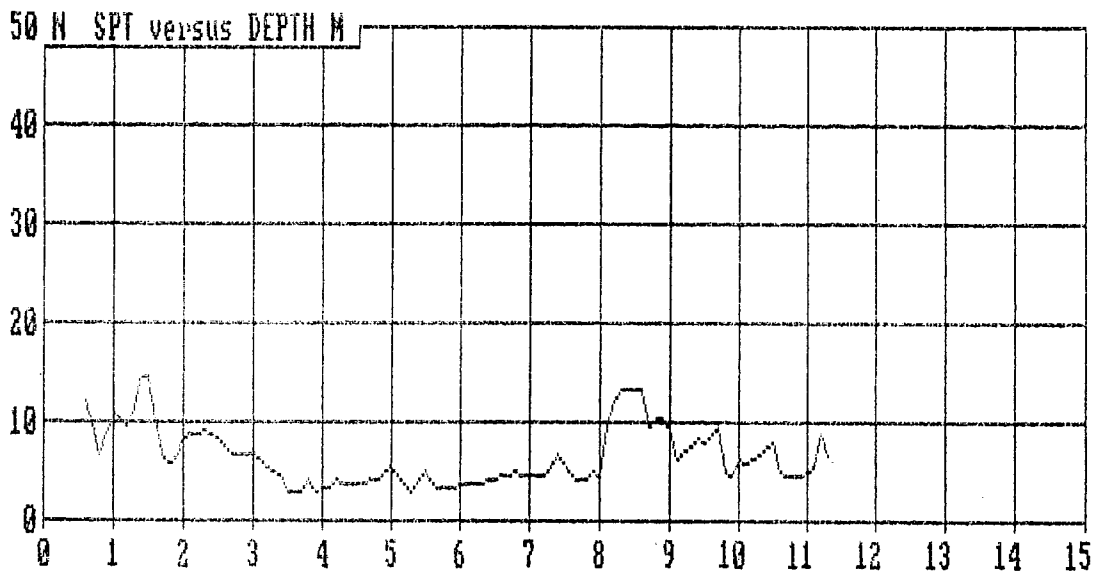
OPERATOR : S.VAN LOCATION : P-2/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SKD102 06-29-94 19:48
OPERATOR : S.VAN LOCATION : P-2/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

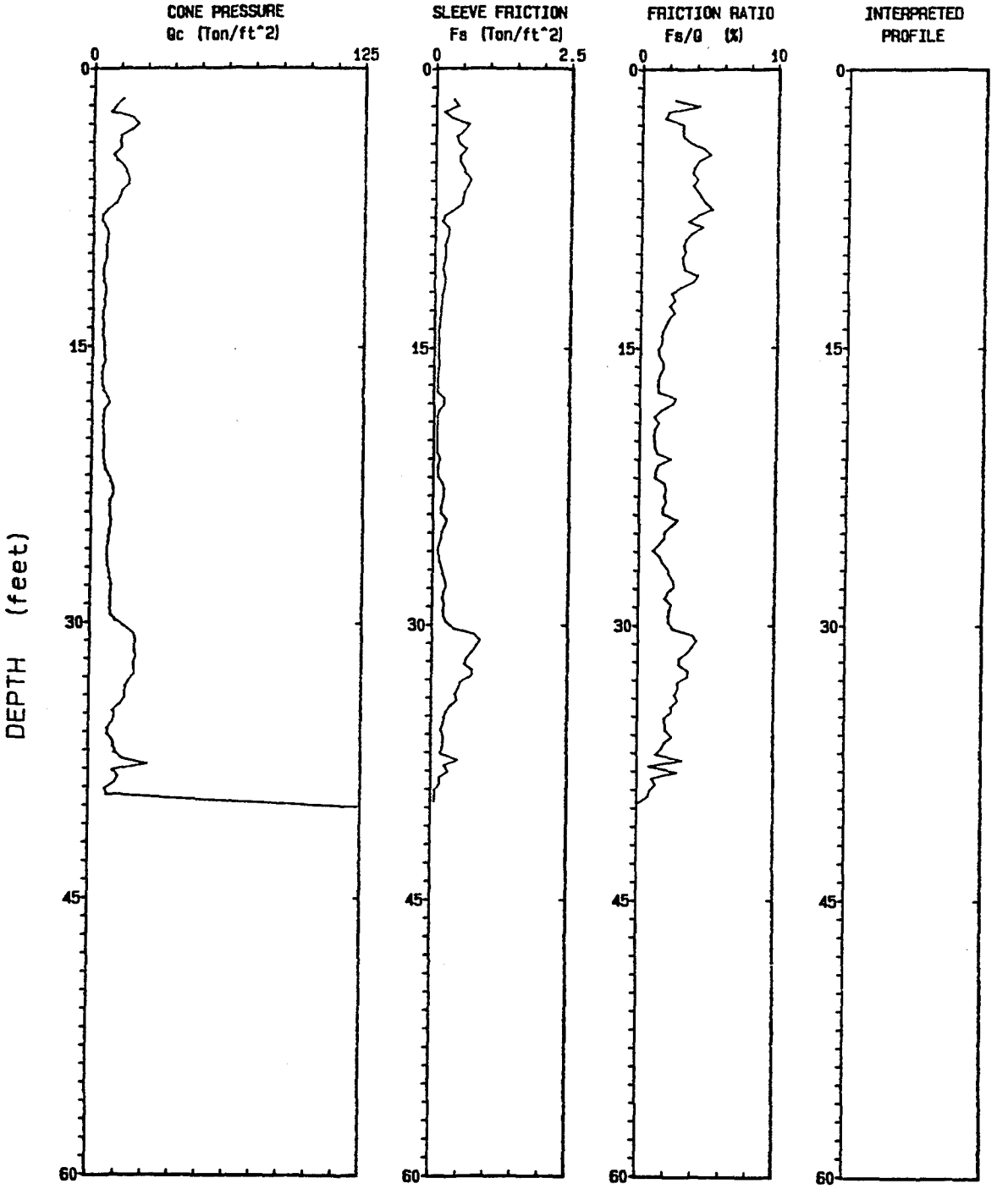


SCPT P-3

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND106 Pg 1 / 1
Client : WES

CPT Date : 06-30-94 16:16
Location : P-3/BFC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 40.03 ft

SOUNDING DATA IN FILE SND106 06-30-94 16:16

OPERATOR : S.VAN LOCATION : P-3/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.50	1.6	13.3	0.327	2.46	0.3	?
0.60	2.0	9.9	0.417	4.20	0.3	silty clay to clay
0.70	2.3	7.7	0.144	1.87	0.1	clayey silt to silty clay
0.80	2.6	17.7	0.299	1.69	0.1	clayey silt to silty clay
0.90	3.0	20.6	0.620	3.02	0.1	clayey silt to silty clay
1.00	3.3	17.2	0.504	2.93	0.1	clayey silt to silty clay
1.10	3.6	12.4	0.382	3.09	0.1	silty clay to clay
1.20	3.9	11.9	0.435	3.65	0.1	clay
1.30	4.3	12.6	0.573	4.54	0.1	clay
1.40	4.6	8.9	0.447	5.01	0.1	clay
1.50	4.9	10.7	0.444	4.14	0.1	clay
1.60	5.2	13.8	0.524	3.80	0.1	clay
1.70	5.6	15.0	0.560	3.74	0.1	silty clay to clay
1.80	5.9	16.0	0.654	4.08	0.1	silty clay to clay
1.90	6.2	16.0	0.593	3.72	0.1	silty clay to clay
2.00	6.6	12.6	0.517	4.10	0.1	clay
2.10	6.9	11.5	0.501	4.34	0.1	clay
2.20	7.2	10.2	0.473	4.65	0.1	clay
2.30	7.5	6.7	0.348	5.20	0.1	clay
2.40	7.9	4.1	0.168	4.11	0.1	clay
2.50	8.2	3.7	0.126	3.42	0.1	clay
2.60	8.5	5.7	0.253	4.46	0.1	clay
2.70	8.9	6.8	0.246	3.63	0.1	clay
2.80	9.2	6.2	0.195	3.20	0.1	clay
2.90	9.5	5.8	0.178	3.07	0.1	clay
3.00	9.8	6.2	0.202	3.24	0.1	clay
3.10	10.2	6.2	0.184	2.97	0.1	clay
3.20	10.5	5.1	0.157	3.07	0.1	clay
3.30	10.8	4.5	0.144	3.18	0.1	clay
3.40	11.2	4.4	0.181	4.14	0.1	clay
3.50	11.5	5.2	0.198	3.79	0.1	clay
3.60	11.8	5.8	0.165	2.83	0.1	clay
3.70	12.1	5.8	0.126	2.18	0.1	silty clay to clay
3.80	12.5	4.8	0.115	2.48	0.1	silty clay to clay
3.90	12.8	5.3	0.108	2.06	0.1	clay
4.00	13.1	4.2	0.102	2.44	0.1	clay
4.10	13.5	4.4	0.091	2.06	0.1	silty clay to clay
4.20	13.8	5.1	0.094	1.83	0.1	silty clay to clay
4.30	14.1	4.5	0.071	1.60	0.1	sensitive fine grained
4.40	14.4	4.5	0.067	1.50	0.1	sensitive fine grained

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.50	14.8	5.4	0.082	1.53	0.1	sensitive fine grained
4.60	15.1	5.3	0.067	1.27	0.1	sensitive fine grained
4.70	15.4	5.1	0.071	1.39	0.1	sensitive fine grained
4.80	15.7	6.1	0.102	1.68	0.1	sensitive fine grained
4.90	16.1	4.8	0.081	1.71	0.1	sensitive fine grained
5.00	16.4	4.3	0.062	1.45	0.1	sensitive fine grained
5.10	16.7	4.2	0.055	1.29	0.1	sensitive fine grained
5.20	17.1	4.6	0.060	1.30	0.1	sensitive fine grained
5.30	17.4	5.5	0.079	1.42	0.1	silty clay to clay
5.40	17.7	7.4	0.197	2.66	0.1	silty clay to clay
5.50	18.0	7.9	0.185	2.36	0.1	silty clay to clay
5.60	18.4	5.5	0.081	1.49	0.1	silty clay to clay
5.70	18.7	5.0	0.051	1.01	0.1	sensitive fine grained
5.80	19.0	4.7	0.065	1.38	0.1	sensitive fine grained
5.90	19.4	5.1	0.055	1.09	0.1	sensitive fine grained
6.00	19.7	5.4	0.055	1.02	0.1	sensitive fine grained
6.10	20.0	5.7	0.062	1.08	0.1	sensitive fine grained
6.20	20.3	5.2	0.059	1.13	0.1	sensitive fine grained
6.30	20.7	4.9	0.064	1.29	0.1	sensitive fine grained
6.40	21.0	5.1	0.118	2.30	0.1	silty clay to clay
6.50	21.3	6.0	0.082	1.36	0.2	sensitive fine grained
6.60	21.7	6.6	0.076	1.16	0.2	sensitive fine grained
6.70	22.0	8.2	0.092	1.13	0.2	clayey silt to silty clay
6.80	22.3	9.0	0.167	1.85	0.2	clayey silt to silty clay
6.90	22.6	10.1	0.199	1.96	0.2	clayey silt to silty clay
7.00	23.0	10.0	0.182	1.81	0.2	clayey silt to silty clay
7.10	23.3	8.5	0.172	2.02	0.2	clayey silt to silty clay
7.20	23.6	8.3	0.144	1.73	0.2	clayey silt to silty clay
7.30	23.9	8.7	0.153	1.76	0.2	silty clay to clay
7.40	24.3	8.8	0.253	2.87	0.2	silty clay to clay
7.50	24.6	8.8	0.203	2.30	0.2	silty clay to clay
7.60	24.9	8.1	0.149	1.84	0.2	silty clay to clay
7.70	25.3	7.7	0.143	1.85	0.2	clayey silt to silty clay
7.80	25.6	7.7	0.111	1.45	0.2	clayey silt to silty clay
7.90	25.9	7.1	0.072	1.02	0.2	sensitive fine grained
8.00	26.2	7.1	0.108	1.52	0.2	clayey silt to silty clay
8.10	26.6	7.3	0.124	1.71	0.2	silty clay to clay
8.20	26.9	7.5	0.157	2.08	0.2	silty clay to clay
8.30	27.2	8.3	0.188	2.26	0.2	silty clay to clay
8.40	27.6	8.9	0.227	2.56	0.2	silty clay to clay
8.50	27.9	9.6	0.250	2.61	0.3	silty clay to clay
8.60	28.2	9.2	0.195	2.12	0.3	silty clay to clay
8.70	28.5	8.8	0.169	1.91	0.3	silty clay to clay
8.80	28.9	8.9	0.215	2.41	0.3	silty clay to clay
8.90	29.2	8.9	0.202	2.26	0.2	silty clay to clay
9.00	29.5	9.5	0.205	2.20	0.2	clayey silt to silty clay
9.10	29.9	11.8	0.266	2.26	0.2	clayey silt to silty clay
9.20	30.2	15.6	0.403	2.58	0.2	clayey silt to silty clay
9.30	30.5	19.6	0.786	4.02	0.2	silty clay to clay
9.40	30.8	20.7	0.886	4.28	0.2	silty clay to clay

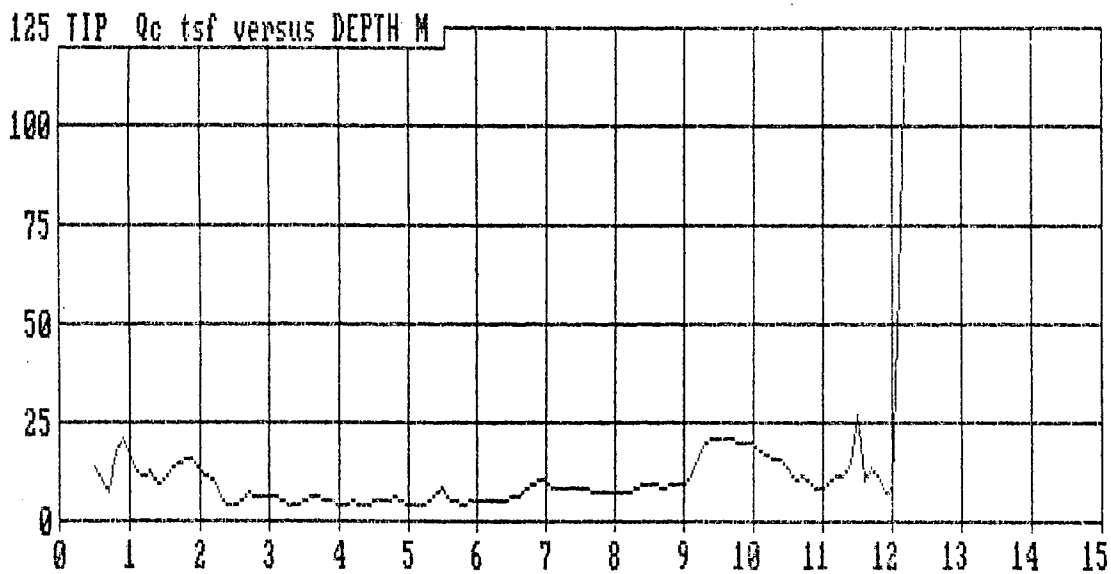
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.50	31.2	20.6	0.810	3.93	0.3	silty clay to clay
9.60	31.5	20.4	0.732	3.59	0.3	silty clay to clay
9.70	31.8	21.2	0.634	2.99	0.3	clayey silt to silty clay
9.80	32.2	19.9	0.596	2.99	0.3	clayey silt to silty clay
9.90	32.5	20.3	0.745	3.68	0.3	silty clay to clay
10.00	32.8	20.3	0.747	3.68	0.3	silty clay to clay
10.10	33.1	18.0	0.522	2.90	0.3	clayey silt to silty clay
10.20	33.5	16.3	0.484	2.97	0.3	clayey silt to silty clay
10.30	33.8	16.1	0.431	2.69	0.3	clayey silt to silty clay
10.40	34.1	15.9	0.468	2.94	0.3	clayey silt to silty clay
10.50	34.4	13.9	0.341	2.45	0.3	clayey silt to silty clay
10.60	34.8	10.7	0.259	2.44	0.3	clayey silt to silty clay
10.70	35.1	11.5	0.219	1.91	0.3	clayey silt to silty clay
10.80	35.4	10.2	0.212	2.09	0.3	clayey silt to silty clay
10.90	35.8	8.3	0.171	2.06	0.3	silty clay to clay
11.00	36.1	8.6	0.221	2.56	0.3	silty clay to clay
11.10	36.4	10.9	0.219	2.02	0.3	clayey silt to silty clay
11.20	36.7	11.3	0.198	1.75	0.3	clayey silt to silty clay
11.30	37.1	11.8	0.165	1.40	0.3	clayey silt to silty clay
11.40	37.4	15.1	0.501	3.32	0.3	clayey silt to silty clay
11.50	37.7	27.0	0.238	0.87	0.5	sandy silt to clayey silt
11.60	38.1	10.8	0.316	2.92	0.5	clayey silt to silty clay
11.70	38.4	13.3	0.139	1.04	0.5	clayey silt to silty clay
11.80	38.7	11.6	0.155	1.34	0.5	clayey silt to silty clay
11.90	39.0	7.4	0.067	0.91	0.5	clayey silt to silty clay
12.00	39.4	8.5	0.066	0.77	0.5	silty sand to sandy silt
12.10	39.7	60.4	0.057	0.09	0.5	?
12.20	40.0	123.9	?	?	0.5	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

SOUNDING DATA IN FILE SND106 06-30-94 16:16
OPERATOR : S.VAN LOCATION : P-3/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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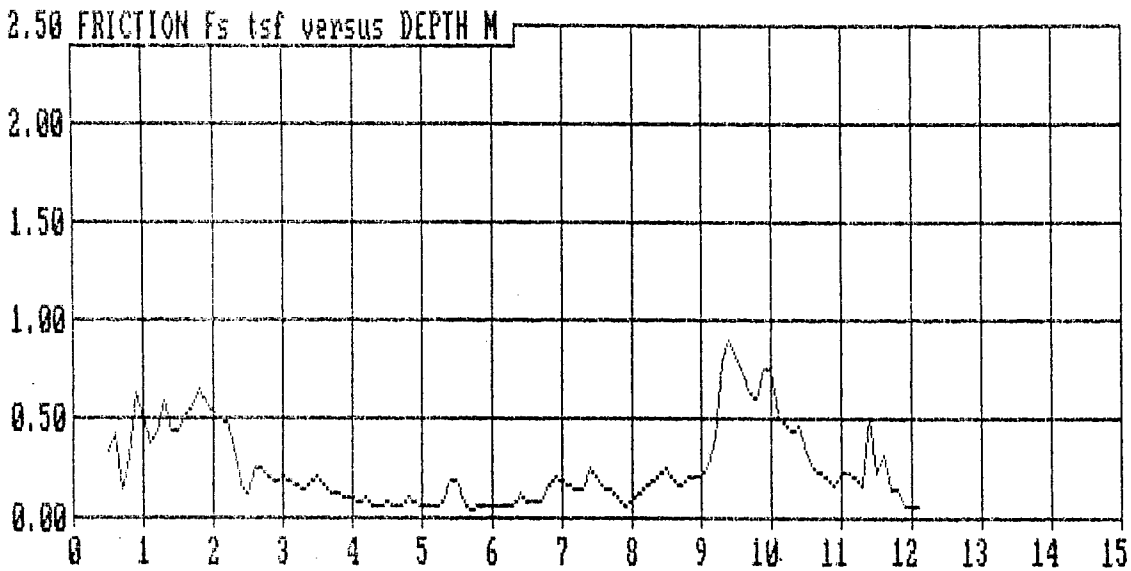

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OPERATOR : S.VAN LOCATION : P-3/BFC-KC MO
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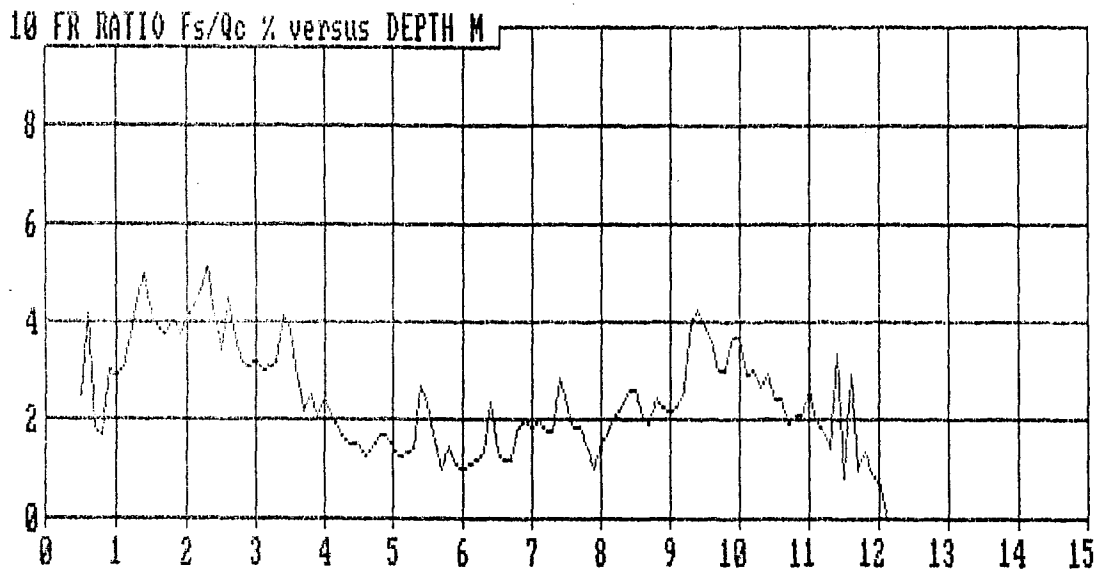

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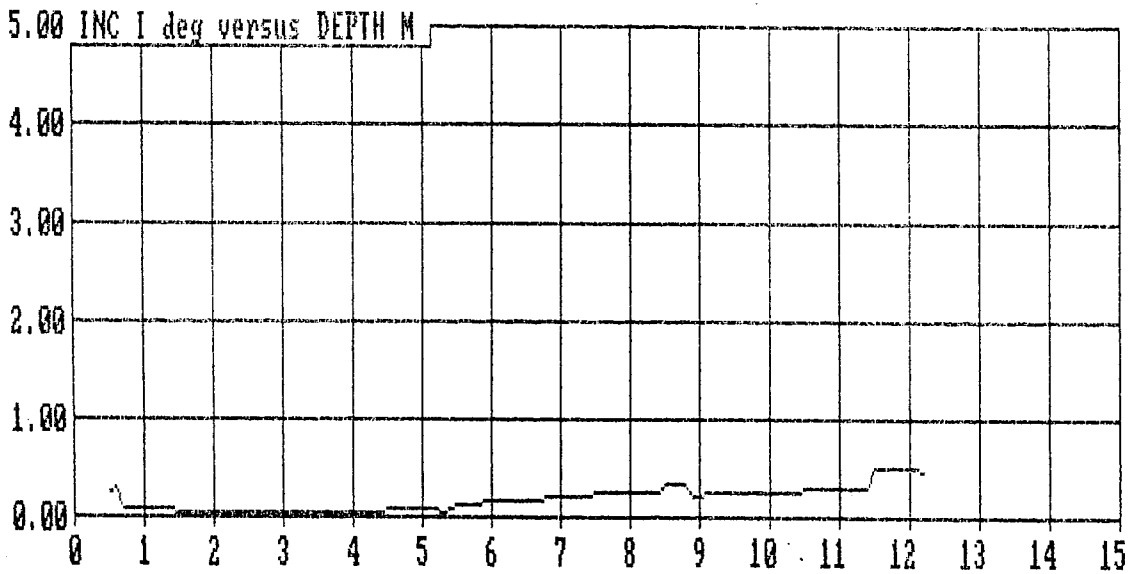

SOUNDING DATA IN FILE SND106 06-30-94 16:16
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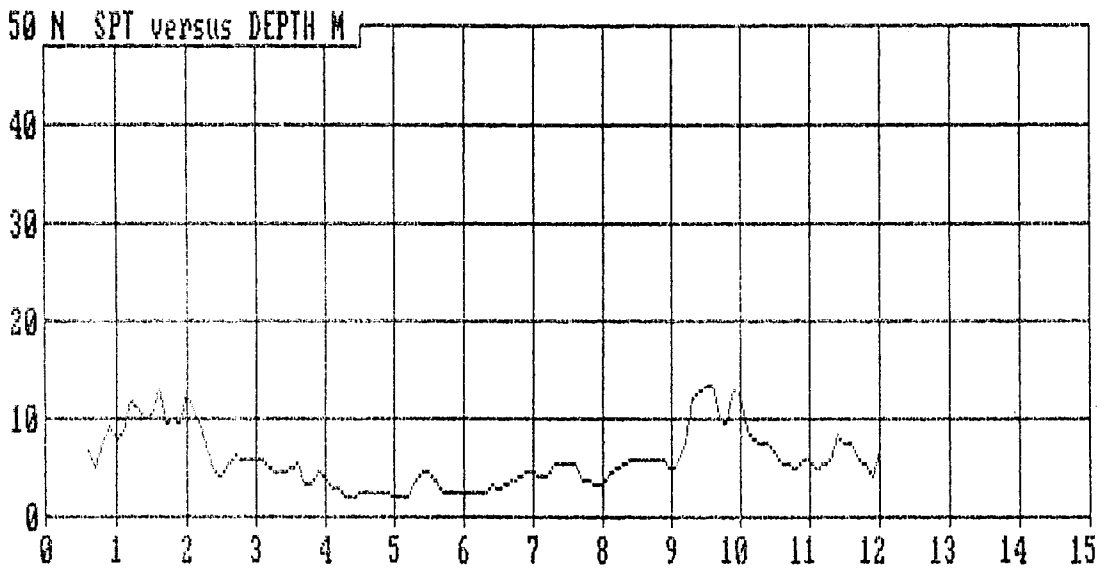
Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

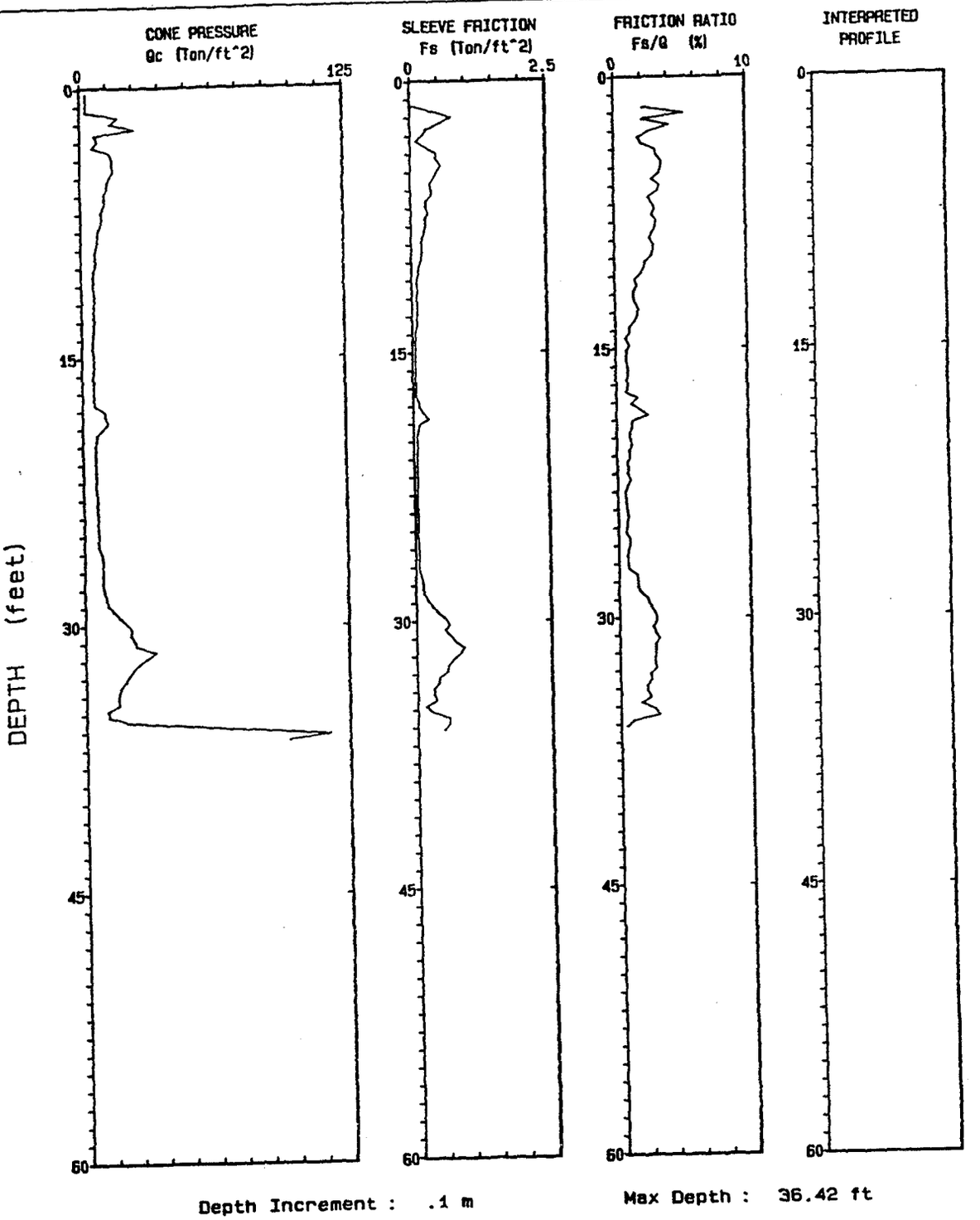


SCPT P-4

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND107 Pg 1 / 1
Client : WES

CPT Date : 06-30-94 17:42
Location : P-4/BFC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 36.42 ft

SOUNDING DATA IN FILE SND107 06-30-94 17:42

OPERATOR : S.VAN LOCATION : P-4/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.10	0.3	2.9	-0.005	-0.20	0.0	?
0.20	0.7	3.0	-0.010	-0.33	0.0	?
0.30	1.0	3.0	-0.010	-0.33	0.0	?
0.40	1.3	2.8	-0.002	-0.07	0.1	sensitive fine grained
0.50	1.6	18.0	0.397	2.20	0.1	silty clay to clay
0.60	2.0	14.5	0.773	5.32	0.0	silty clay to clay
0.70	2.3	25.0	0.564	2.17	0.0	clayey silt to silty clay
0.80	2.6	6.8	0.287	4.25	0.0	silty clay to clay
0.90	3.0	8.1	0.216	2.67	0.0	clay
1.00	3.3	5.7	0.102	1.79	0.0	silty clay to clay
1.10	3.6	13.8	0.288	2.09	0.0	clayey silt to silty clay
1.20	3.9	15.3	0.473	3.09	0.0	clayey silt to silty clay
1.30	4.3	14.9	0.482	3.24	0.0	silty clay to clay
1.40	4.6	15.7	0.569	3.62	0.0	silty clay to clay
1.50	4.9	13.8	0.490	3.54	0.0	silty clay to clay
1.60	5.2	12.9	0.438	3.38	0.0	silty clay to clay
1.70	5.6	12.5	0.358	2.86	0.0	silty clay to clay
1.80	5.9	11.1	0.386	3.47	0.0	silty clay to clay
1.90	6.2	11.5	0.372	3.25	0.0	silty clay to clay
2.00	6.6	11.0	0.285	2.59	0.0	silty clay to clay
2.10	6.9	9.3	0.267	2.87	0.0	silty clay to clay
2.20	7.2	10.1	0.309	3.06	0.1	silty clay to clay
2.30	7.5	9.3	0.261	2.81	0.0	silty clay to clay
2.40	7.9	8.1	0.257	3.17	0.0	silty clay to clay
2.50	8.2	7.8	0.236	3.03	0.0	clay
2.60	8.5	7.4	0.211	2.84	0.0	silty clay to clay
2.70	8.9	6.9	0.182	2.63	0.0	silty clay to clay
2.80	9.2	6.4	0.186	2.92	0.0	clay
2.90	9.5	6.5	0.186	2.86	0.0	clay
3.00	9.8	6.6	0.184	2.76	0.0	clay
3.10	10.2	5.7	0.128	2.27	0.0	silty clay to clay
3.20	10.5	5.3	0.112	2.12	0.0	silty clay to clay
3.30	10.8	5.5	0.106	1.93	0.0	silty clay to clay
3.40	11.2	5.3	0.079	1.48	0.0	sensitive fine grained
3.50	11.5	6.0	0.099	1.65	0.0	sensitive fine grained
3.60	11.8	5.7	0.077	1.34	0.0	sensitive fine grained
3.70	12.1	5.5	0.077	1.40	0.0	sensitive fine grained
3.80	12.5	5.5	0.082	1.51	0.0	sensitive fine grained
3.90	12.8	5.7	0.098	1.72	0.0	sensitive fine grained
4.00	13.1	5.6	0.094	1.67	0.0	sensitive fine grained

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.10	13.5	5.9	0.084	1.43	0.0	sensitive fine grained
4.20	13.8	5.0	0.050	0.99	0.0	sensitive fine grained
4.30	14.1	4.6	0.045	0.98	0.0	sensitive fine grained
4.40	14.4	4.6	0.032	0.70	0.0	sensitive fine grained
4.50	14.8	5.7	0.058	1.02	0.0	sensitive fine grained
4.60	15.1	5.6	0.042	0.75	0.0	sensitive fine grained
4.70	15.4	5.5	0.041	0.80	0.0	sensitive fine grained
4.80	15.7	5.5	0.044	0.79	0.0	sensitive fine grained
4.90	16.1	5.0	0.044	0.88	0.0	sensitive fine grained
5.00	16.4	5.0	0.048	0.95	0.0	sensitive fine grained
5.10	16.7	5.2	0.041	0.79	0.0	sensitive fine grained
5.20	17.1	5.1	0.041	0.81	0.0	sensitive fine grained
5.30	17.4	4.8	0.034	0.71	0.0	sensitive fine grained
5.40	17.7	6.1	0.097	1.59	0.0	sensitive fine grained
5.50	18.0	10.7	0.115	1.07	0.0	clayey silt to silty clay
5.60	18.4	10.7	0.184	1.72	0.0	clayey silt to silty clay
5.70	18.7	12.1	0.292	2.42	0.0	clayey silt to silty clay
5.80	19.0	9.4	0.105	1.12	0.1	clayey silt to silty clay
5.90	19.4	6.6	0.072	1.09	0.0	sensitive fine grained
6.00	19.7	6.0	0.058	0.96	0.0	sensitive fine grained
6.10	20.0	5.7	0.055	0.97	0.0	sensitive fine grained
6.20	20.3	6.0	0.068	1.13	0.0	sensitive fine grained
6.30	20.7	5.7	0.051	0.90	0.0	sensitive fine grained
6.40	21.0	5.6	0.057	1.02	0.0	sensitive fine grained
6.50	21.3	6.1	0.044	0.73	0.0	sensitive fine grained
6.60	21.7	5.6	0.045	0.80	0.0	sensitive fine grained
6.70	22.0	5.8	0.046	0.80	0.0	sensitive fine grained
6.80	22.3	6.1	0.059	0.97	0.0	sensitive fine grained
6.90	22.6	6.2	0.043	0.69	0.0	sensitive fine grained
7.00	23.0	6.5	0.037	0.56	0.0	sensitive fine grained
7.10	23.3	6.4	0.036	0.56	0.0	sensitive fine grained
7.20	23.6	6.2	0.039	0.62	0.0	sensitive fine grained
7.30	23.9	6.1	0.040	0.66	0.0	sensitive fine grained
7.40	24.3	5.2	0.040	0.78	0.0	sensitive fine grained
7.50	24.6	6.8	0.042	0.61	0.0	sensitive fine grained
7.60	24.9	6.7	0.039	0.58	0.0	sensitive fine grained
7.70	25.3	6.4	0.037	0.57	0.0	sensitive fine grained
7.80	25.6	6.8	0.059	0.86	0.0	sensitive fine grained
7.90	25.9	7.6	0.060	0.80	0.0	sensitive fine grained
8.00	26.2	8.5	0.057	0.67	0.0	sensitive fine grained
8.10	26.6	8.8	0.053	0.60	0.0	sensitive fine grained
8.20	26.9	8.5	0.058	0.69	0.0	sensitive fine grained
8.30	27.2	8.4	0.062	0.74	0.0	clayey silt to silty clay
8.40	27.6	8.4	0.113	1.35	0.0	clayey silt to silty clay
8.50	27.9	9.1	0.132	1.45	0.0	clayey silt to silty clay
8.60	28.2	9.6	0.139	1.44	0.0	clayey silt to silty clay
8.70	28.5	10.5	0.176	1.68	0.0	clayey silt to silty clay
8.80	28.9	11.3	0.239	2.12	0.0	clayey silt to silty clay
8.90	29.2	13.5	0.310	2.30	0.0	clayey silt to silty clay
9.00	29.5	16.0	0.410	2.55	0.0	clayey silt to silty clay

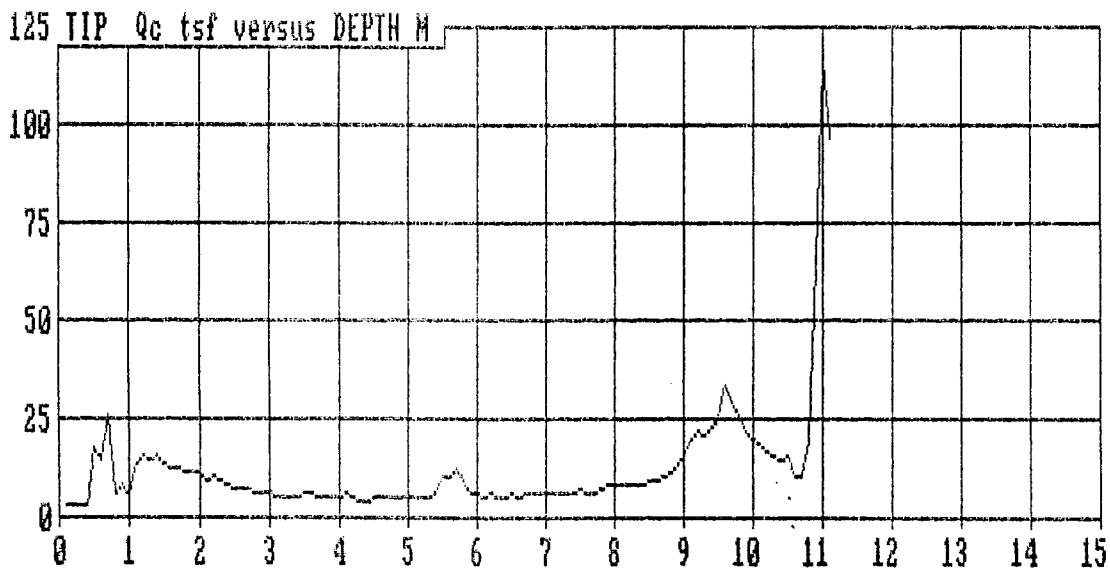
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.10	29.9	19.5	0.543	2.78	0.0	clayey silt to silty clay
9.20	30.2	22.2	0.614	2.77	0.0	clayey silt to silty clay
9.30	30.5	21.3	0.531	2.50	0.0	clayey silt to silty clay
9.40	30.8	23.1	0.643	2.78	0.0	clayey silt to silty clay
9.50	31.2	24.6	0.735	2.99	0.0	clayey silt to silty clay
9.60	31.5	33.5	0.887	2.65	0.0	sandy silt to clayey silt
9.70	31.8	29.6	0.801	2.76	0.0	sandy silt to clayey silt
9.80	32.2	25.7	0.678	2.64	0.0	clayey silt to silty clay
9.90	32.5	22.4	0.582	2.60	0.0	clayey silt to silty clay
10.00	32.8	20.3	0.566	2.76	0.0	clayey silt to silty clay
10.10	33.1	18.5	0.417	2.26	0.0	clayey silt to silty clay
10.20	33.5	16.4	0.390	2.37	0.0	clayey silt to silty clay
10.30	33.8	15.1	0.300	1.98	0.0	clayey silt to silty clay
10.40	34.1	14.9	0.293	1.98	0.0	clayey silt to silty clay
10.50	34.4	15.4	0.350	2.26	0.0	clayey silt to silty clay
10.60	34.8	10.0	0.159	1.57	0.0	clayey silt to silty clay
10.70	35.1	10.7	0.278	2.60	0.0	clayey silt to silty clay
10.80	35.4	20.2	0.598	2.95	0.0	sandy silt to clayey silt
10.90	35.8	64.6	0.585	0.90	0.1	sand to silty sand
11.00	36.1	116.2	0.491	0.42	0.1	?
11.10	36.4	96.8	?	?	0.1	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

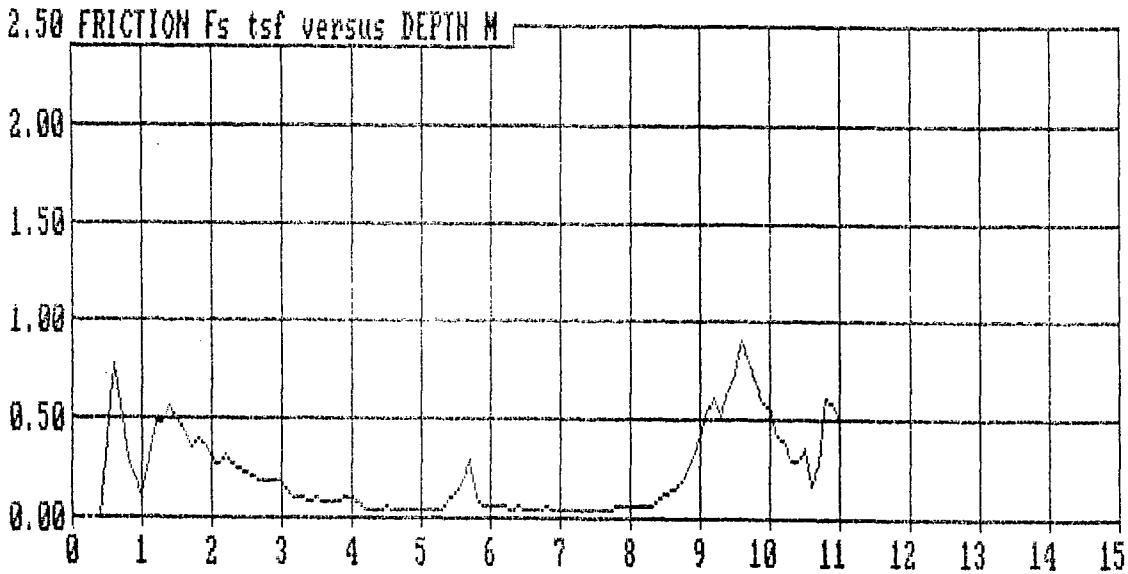
SOUNDING DATA IN FILE SND107 06-30-94 17:42
OPERATOR : S.VAN LOCATION : P-4/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



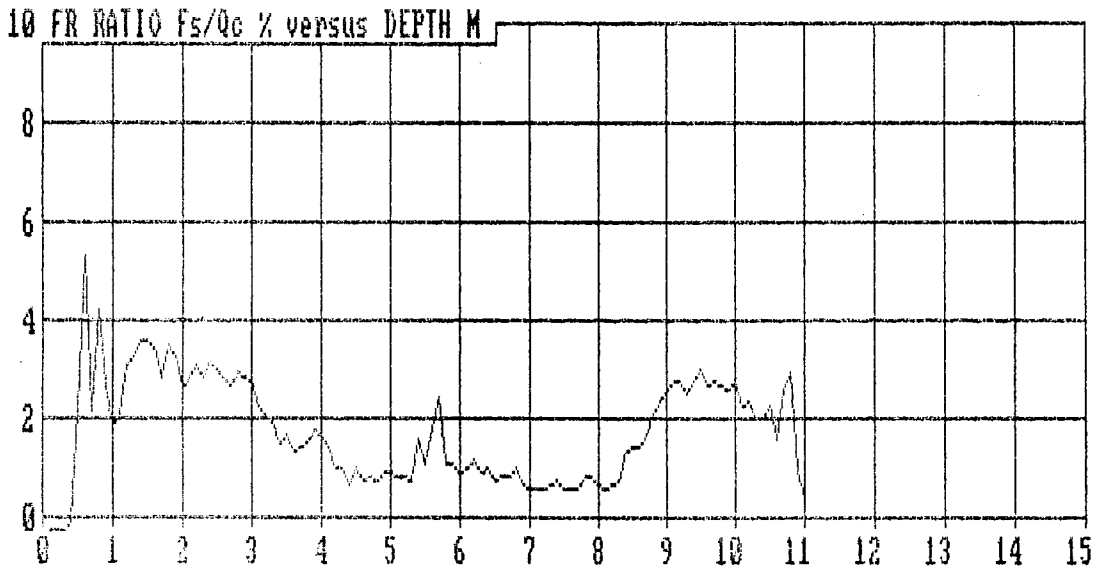
SOUNDING DATA IN FILE SND107 06-30-94 17:42
OPERATOR : S.VAN LOCATION : P-4/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



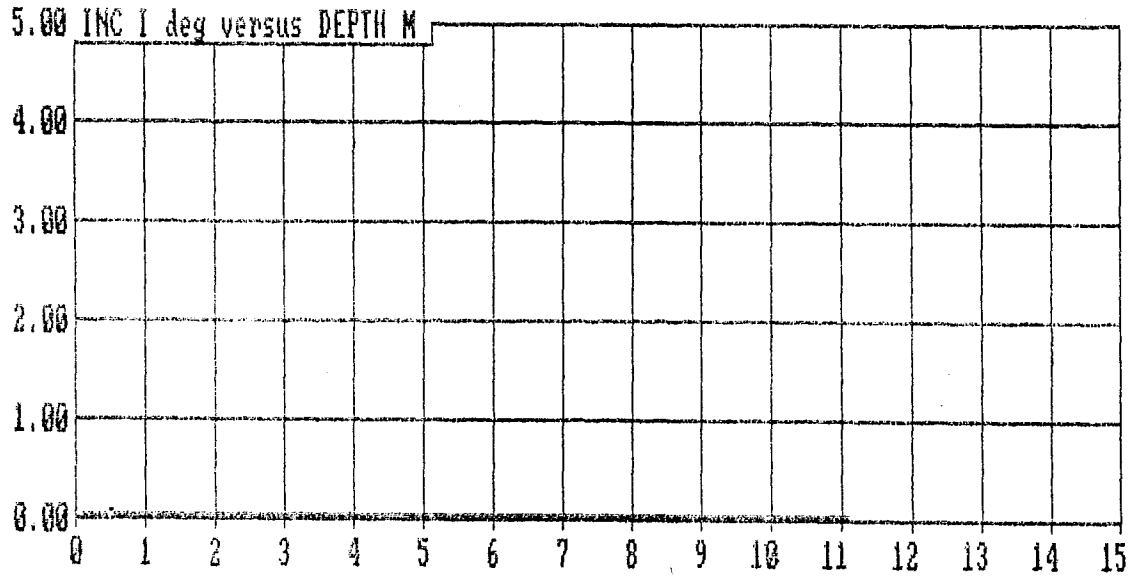
SOUNDING DATA IN FILE SND107 06-30-94 17:42
OPERATOR : S.VAN LOCATION : P-4/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



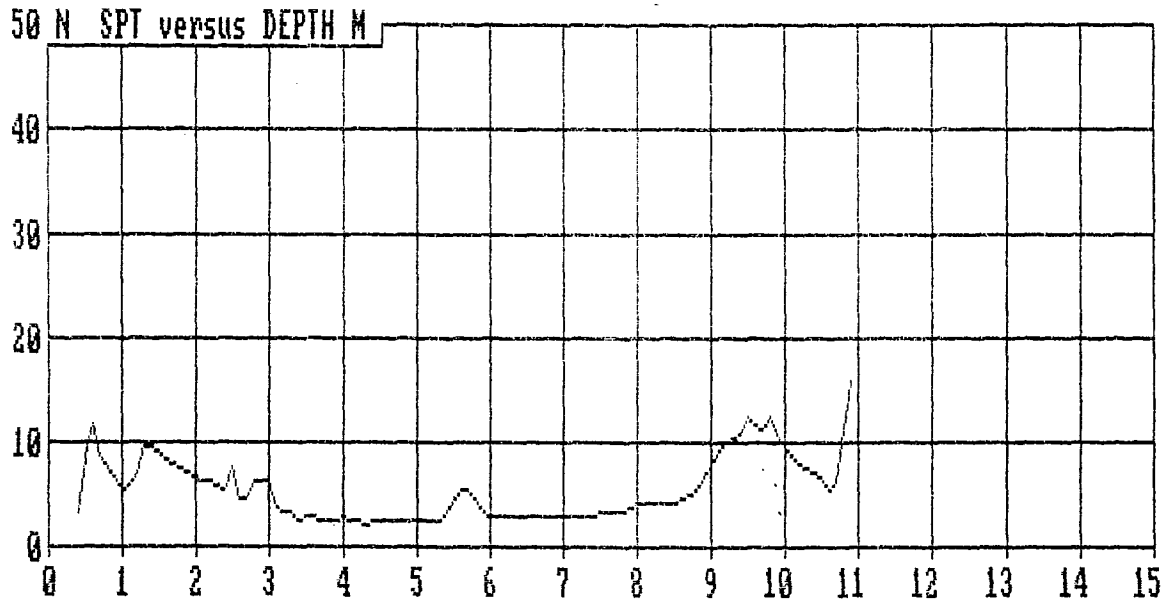
SOUNDING DATA IN FILE SHD107 06-30-94 17:42
OPERATOR : S.VAN LOCATION : P-4/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon, 97106 (503) 324 3261



SOUNDING DATA IN FILE SND107 06-30-94 17:42
OPERATOR : S.VAN LOCATION : P-4/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

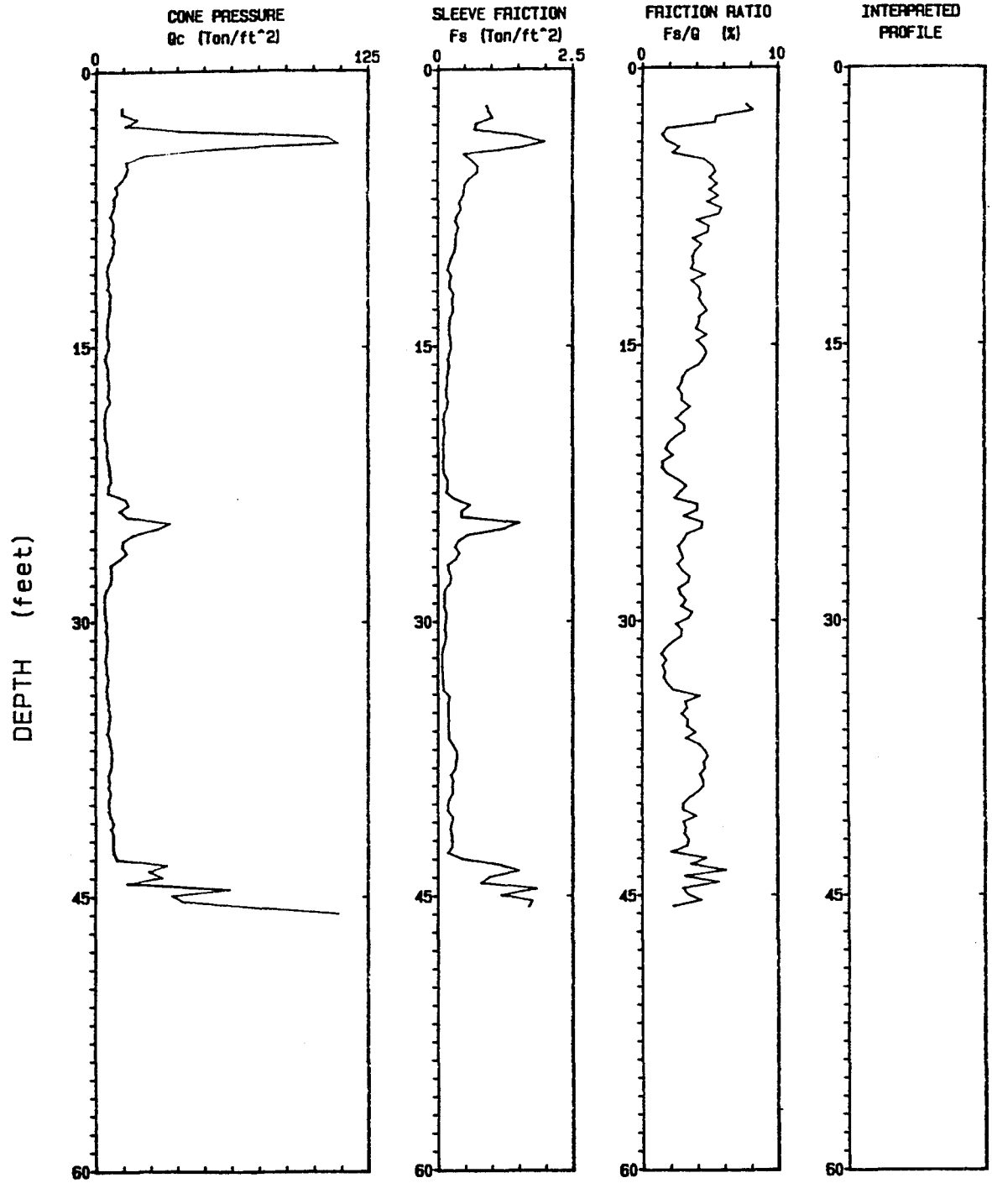


SCPT P-5

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND-92 Pg 1 / 1
Client : WES

CPT Date : 06-27-94 15:58
Location : P5/BFC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 45.93 ft

SOUNDING DATA IN FILE SND-92 06-27-94 15:58

OPERATOR : S.VAN LOCATION : P5/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.60	2.0	11.9	0.917	7.70	0.1	?
0.70	2.3	11.7	0.952	8.15	0.1	clay
0.80	2.6	18.9	1.022	5.41	0.1	clay
0.90	3.0	13.3	0.711	5.33	0.1	silty clay to clay
1.00	3.3	38.4	0.690	1.80	0.1	silty sand to sandy silt
1.10	3.6	106.3	1.547	1.46	0.1	silty sand to sandy silt
1.20	3.9	111.2	1.989	1.78	0.1	silty sand to sandy silt
1.30	4.3	54.9	1.508	2.75	0.1	sandy silt to clayey silt
1.40	4.6	21.8	0.483	2.22	0.1	clayey silt to silty clay
1.50	4.9	13.7	0.629	4.58	0.1	silty clay to clay
1.60	5.2	14.5	0.754	5.21	0.1	clay
1.70	5.6	13.5	0.736	5.45	0.1	clay
1.80	5.9	11.7	0.581	4.97	0.1	clay
1.90	6.2	8.9	0.497	5.57	0.1	clay
2.00	6.6	9.9	0.489	4.96	0.1	clay
2.10	6.9	8.1	0.458	5.68	0.1	clay
2.20	7.2	8.0	0.385	4.80	0.1	clay
2.30	7.5	7.4	0.435	5.87	0.1	clay
2.40	7.9	6.3	0.352	5.61	0.1	clay
2.50	8.2	7.9	0.319	4.01	0.0	clay
2.60	8.5	7.8	0.362	4.93	0.0	clay
2.70	8.9	7.1	0.340	4.81	0.0	clay
2.80	9.2	8.5	0.316	3.74	0.0	clay
2.90	9.5	7.5	0.329	4.40	0.0	clay
3.00	9.8	7.7	0.301	3.92	0.0	clay
3.10	10.2	6.6	0.245	3.70	0.0	clay
3.20	10.5	5.5	0.209	3.82	0.0	clay
3.30	10.8	4.8	0.175	3.61	0.0	clay
3.40	11.2	5.4	0.255	4.70	0.0	clay
3.50	11.5	6.0	0.218	3.64	0.0	clay
3.60	11.8	5.2	0.217	4.19	0.0	clay
3.70	12.1	6.8	0.298	4.36	0.0	clay
3.80	12.5	6.2	0.262	4.19	0.0	clay
3.90	12.8	6.1	0.274	4.51	0.0	clay
4.00	13.1	5.9	0.280	4.77	0.0	clay
4.10	13.5	5.2	0.216	4.18	0.0	clay
4.20	13.8	5.0	0.206	4.15	0.0	clay
4.30	14.1	5.0	0.197	3.95	0.0	clay
4.40	14.4	4.6	0.221	4.78	0.0	clay
4.50	14.8	5.9	0.237	4.01	0.0	clay

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

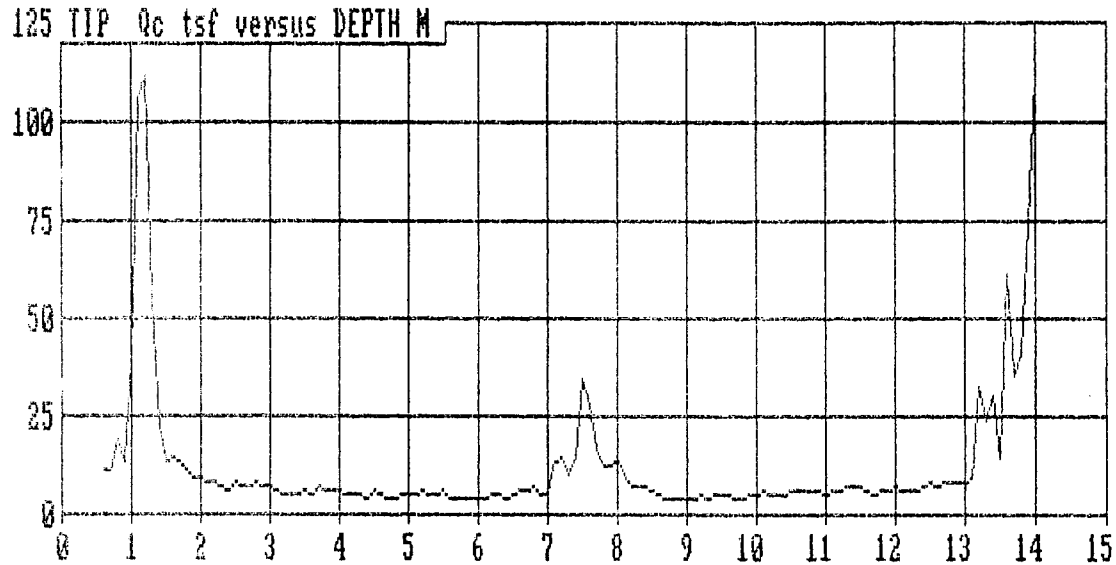
DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.60	15.1	5.5	0.248	4.54	0.0	clay
4.70	15.4	4.3	0.206	4.77	0.0	clay
4.80	15.7	4.0	0.181	4.52	0.0	clay
4.90	16.1	5.2	0.214	4.15	0.0	clay
5.00	16.4	5.6	0.184	3.30	0.0	clay
5.10	16.7	5.4	0.155	2.87	0.0	clay
5.20	17.1	6.1	0.174	2.87	0.0	clay
5.30	17.4	5.7	0.148	2.62	0.0	clay
5.40	17.7	5.3	0.155	2.97	0.0	clay
5.50	18.0	6.5	0.192	2.94	0.0	clay
5.60	18.4	4.6	0.163	3.56	0.0	clay
5.70	18.7	3.9	0.115	2.95	0.0	clay
5.80	19.0	3.8	0.095	2.50	0.0	clay
5.90	19.4	3.9	0.121	3.13	0.0	clay
6.00	19.7	4.3	0.135	3.13	0.0	clay
6.10	20.0	4.2	0.100	2.40	0.0	clay
6.20	20.3	5.1	0.098	1.92	0.0	silty clay to clay
6.30	20.7	5.1	0.086	1.69	0.0	silty clay to clay
6.40	21.0	4.7	0.105	2.26	0.0	silty clay to clay
6.50	21.3	5.6	0.083	1.48	0.0	sensitive fine grained
6.60	21.7	6.2	0.090	1.45	0.0	sensitive fine grained
6.70	22.0	6.3	0.117	1.84	0.0	silty clay to clay
6.80	22.3	6.9	0.182	2.65	0.0	silty clay to clay
6.90	22.6	5.4	0.177	3.27	0.0	clay
7.00	23.0	5.5	0.154	2.77	0.0	silty clay to clay
7.10	23.3	13.3	0.315	2.37	0.0	silty clay to clay
7.20	23.6	14.9	0.609	4.09	0.0	silty clay to clay
7.30	23.9	10.8	0.437	4.05	0.0	clay
7.40	24.3	14.3	0.437	3.06	0.0	silty clay to clay
7.50	24.6	34.0	1.525	4.49	0.0	silty clay to clay
7.60	24.9	27.9	1.216	4.36	0.0	silty clay to clay
7.70	25.3	16.8	0.551	3.27	0.0	silty clay to clay
7.80	25.6	12.3	0.371	3.02	0.0	silty clay to clay
7.90	25.9	12.0	0.318	2.65	0.0	silty clay to clay
8.00	26.2	14.2	0.408	2.88	0.0	silty clay to clay
8.10	26.6	10.7	0.326	3.04	0.0	silty clay to clay
8.20	26.9	6.9	0.180	2.60	0.0	silty clay to clay
8.30	27.2	7.2	0.216	2.98	0.0	clay
8.40	27.6	7.0	0.245	3.49	0.0	clay
8.50	27.9	6.5	0.216	3.33	0.0	clay
8.60	28.2	4.8	0.126	2.64	0.0	clay
8.70	28.5	3.7	0.106	2.84	0.0	clay
8.80	28.9	3.7	0.119	3.23	0.0	clay
8.90	29.2	3.9	0.111	2.86	0.0	clay
9.00	29.5	4.2	0.155	3.71	0.0	clay
9.10	29.9	4.4	0.149	3.40	0.0	clay
9.20	30.2	5.0	0.125	2.49	0.0	clay
9.30	30.5	4.3	0.126	2.94	0.0	clay
9.40	30.8	5.3	0.152	2.88	0.0	clay
9.50	31.2	5.3	0.117	2.21	0.0	silty clay to clay

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.60	31.5	5.0	0.085	1.71	0.0	silty clay to clay
9.70	31.8	4.7	0.065	1.40	0.0	sensitive fine grained
9.80	32.2	4.3	0.076	1.79	0.0	sensitive fine grained
9.90	32.5	5.0	0.076	1.51	0.0	sensitive fine grained
10.00	32.8	5.1	0.088	1.71	0.0	sensitive fine grained
10.10	33.1	5.9	0.093	1.58	0.0	silty clay to clay
10.20	33.5	5.3	0.101	1.92	0.0	silty clay to clay
10.30	33.8	4.8	0.112	2.31	0.0	clay
10.40	34.1	5.1	0.216	4.26	0.0	clay
10.50	34.4	5.8	0.181	3.12	0.0	clay
10.60	34.8	5.8	0.193	3.31	0.0	clay
10.70	35.1	6.6	0.190	2.86	0.0	clay
10.80	35.4	6.0	0.202	3.39	0.0	clay
10.90	35.8	5.7	0.188	3.28	0.0	clay
11.00	36.1	5.2	0.204	3.95	0.0	clay
11.10	36.4	6.5	0.208	3.21	0.0	clay
11.20	36.7	6.7	0.283	4.21	0.0	clay
11.30	37.1	7.5	0.345	4.63	0.0	clay
11.40	37.4	7.5	0.363	4.86	0.0	clay
11.50	37.7	7.3	0.330	4.52	0.0	clay
11.60	38.1	6.8	0.315	4.66	0.0	clay
11.70	38.4	5.6	0.238	4.24	0.0	clay
11.80	38.7	6.5	0.291	4.51	0.0	clay
11.90	39.0	5.7	0.261	4.54	0.0	clay
12.00	39.4	7.0	0.283	4.05	0.0	clay
12.10	39.7	6.1	0.209	3.44	0.0	clay
12.20	40.0	6.0	0.179	2.99	0.0	clay
12.30	40.4	6.3	0.190	3.00	0.0	clay
12.40	40.7	6.9	0.276	4.00	0.0	clay
12.50	41.0	8.3	0.248	3.00	0.0	clay
12.60	41.3	6.8	0.222	3.20	0.0	clay
12.70	41.7	8.3	0.255	3.06	0.0	clay
12.80	42.0	7.8	0.268	3.44	0.0	clay
12.90	42.3	8.0	0.259	3.25	0.0	silty clay to clay
13.00	42.7	8.5	0.180	2.12	0.0	silty clay to clay
13.10	43.0	9.7	0.460	4.73	0.0	silty clay to clay
13.20	43.3	32.7	1.179	3.61	0.0	silty clay to clay
13.30	43.6	24.3	1.509	6.20	0.0	clay
13.40	44.0	30.6	0.961	3.14	0.0	silty clay to clay
13.50	44.3	14.3	0.809	5.66	0.0	clayey silt to silty clay
13.50	44.6	62.0	1.846	2.98	0.0	clayey silt to silty clay
13.70	44.9	35.4	1.192	3.37	0.0	clayey silt to silty clay
13.80	45.3	40.3	1.764	4.37	0.0	clayey silt to silty clay
13.90	45.6	73.6	1.690	2.30	0.0	?
14.00	45.9	111.3	?	?	0.0	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 * sliding data average

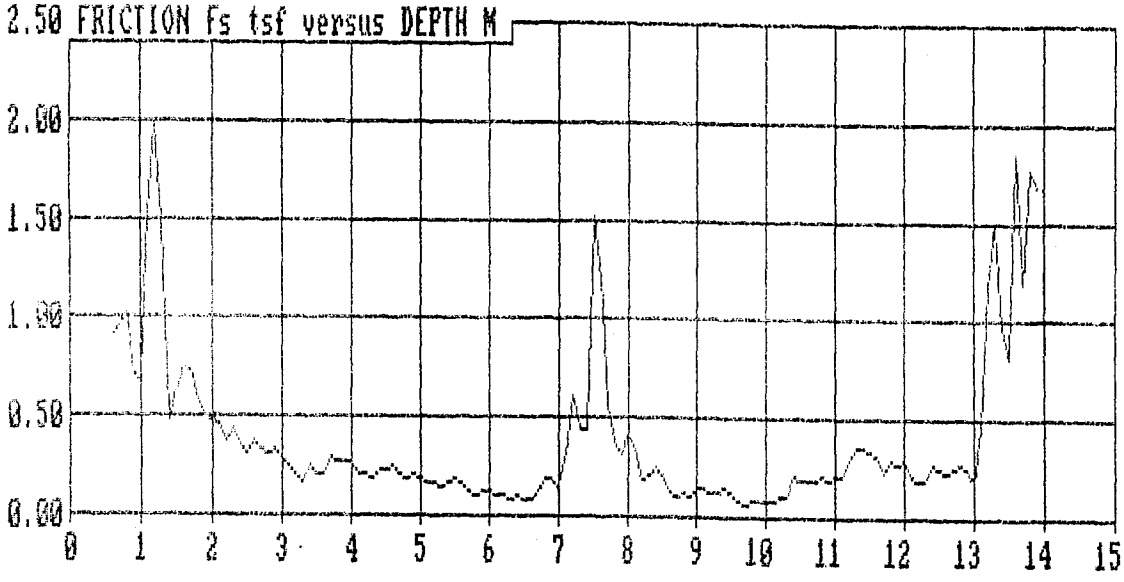
SOUNDING DATA IN FILE SND-92 06-27-94 15:58
OPERATOR : S.VAN LOCATION : P5/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND-92 06-27-94 15:58
OPERATOR : S.VAN LOCATION : P5/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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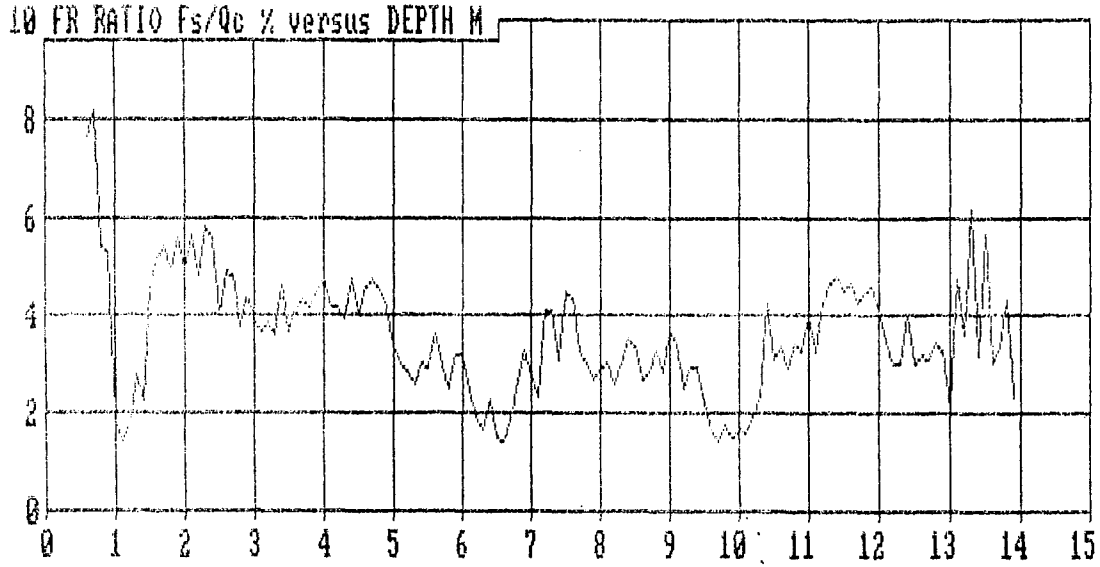
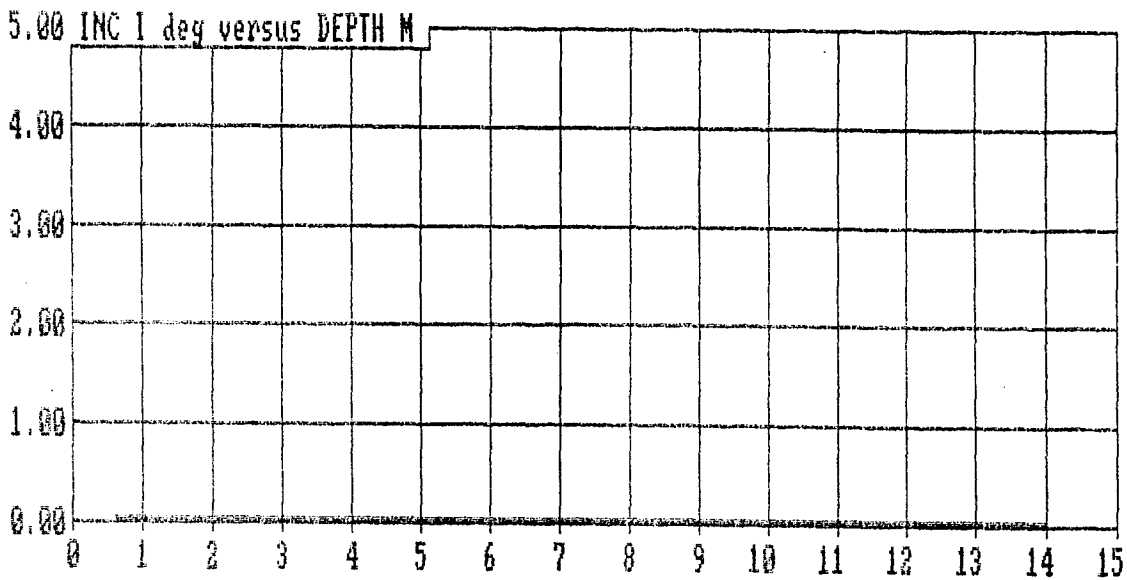
OPERATOR : S.VAN LOCATION : P5/BFC-KC MO
CLIENT : HES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



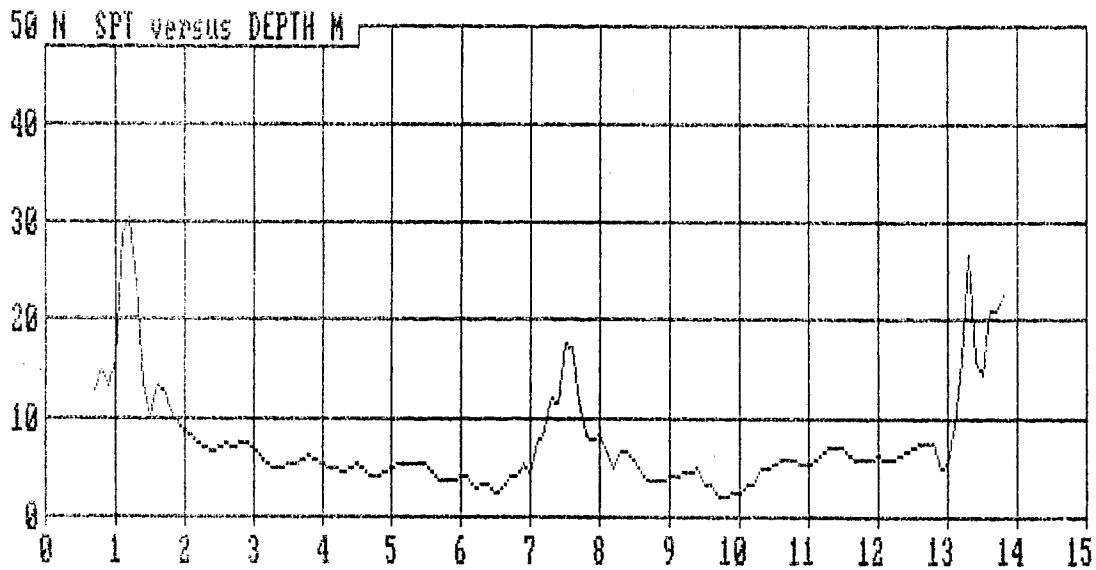
SOUNDING DATA IN FILE SND-92 06-27-94 15:58
OPERATOR : S.VAN LOCATION : P5/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND-92 06-27-94 15:58
OPERATOR : S.VAN LOCATION : P5/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

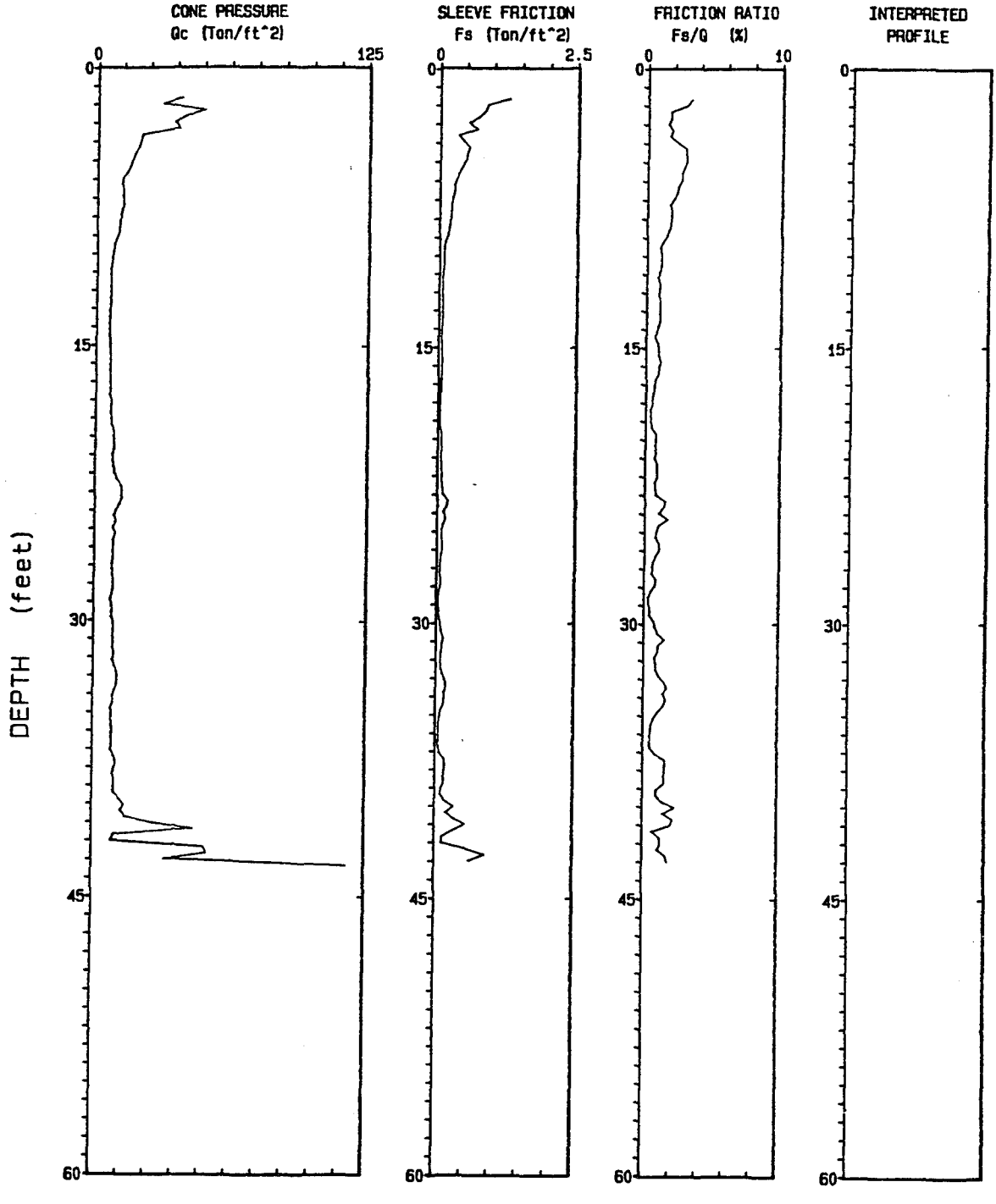


SCPT P-6

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND100 Pg 1 / 1
Client : WES

CPT Date : 06-29-94 15:55
Location : P-6A/BFC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 43.31 ft

SOUNDING DATA IN FILE SND100 06-29-94 15:55

OPERATOR : S.VAN LOCATION : P-6A/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.50	1.6	39.2	1.258	3.21	0.1	?
0.60	2.0	30.6	0.861	2.81	0.1	sandy silt to clayey silt
0.70	2.3	49.8	0.813	1.63	0.1	sandy silt to clayey silt
0.80	2.6	40.5	0.694	1.71	0.1	silty sand to sandy silt
0.90	3.0	35.8	0.522	1.46	0.1	sandy silt to clayey silt
1.00	3.3	38.0	0.602	1.79	0.1	sandy silt to clayey silt
1.10	3.6	20.6	0.328	1.59	0.1	sandy silt to clayey silt
1.20	3.9	19.7	0.434	2.20	0.1	clayey silt to silty clay
1.30	4.3	18.8	0.537	2.85	0.1	clayey silt to silty clay
1.40	4.6	17.1	0.479	2.80	0.1	clayey silt to silty clay
1.50	4.9	16.0	0.467	2.92	0.1	clayey silt to silty clay
1.60	5.2	15.2	0.409	2.69	0.1	clayey silt to silty clay
1.70	5.6	13.7	0.344	2.50	0.1	clayey silt to silty clay
1.80	5.9	11.6	0.298	2.56	0.1	clayey silt to silty clay
1.90	6.2	11.3	0.255	2.25	0.1	clayey silt to silty clay
2.00	6.6	12.1	0.261	2.16	0.1	clayey silt to silty clay
2.10	6.9	11.9	0.231	1.94	0.1	clayey silt to silty clay
2.20	7.2	12.4	0.203	1.64	0.1	clayey silt to silty clay
2.30	7.5	11.6	0.211	1.82	0.1	clayey silt to silty clay
2.40	7.9	10.9	0.192	1.76	0.1	clayey silt to silty clay
2.50	8.2	10.7	0.188	1.76	0.1	clayey silt to silty clay
2.60	8.5	10.4	0.170	1.64	0.1	clayey silt to silty clay
2.70	8.9	9.8	0.141	1.43	0.1	clayey silt to silty clay
2.80	9.2	8.7	0.098	1.13	0.1	clayey silt to silty clay
2.90	9.5	7.8	0.071	0.91	0.1	clayey silt to silty clay
3.00	9.8	7.3	0.077	1.05	0.1	sensitive fine grained
3.10	10.2	6.8	0.072	1.05	0.1	sensitive fine grained
3.20	10.5	6.7	0.071	1.05	0.1	sensitive fine grained
3.30	10.8	6.3	0.056	0.89	0.1	sensitive fine grained
3.40	11.2	6.1	0.048	0.79	0.1	sensitive fine grained
3.50	11.5	6.8	0.066	0.97	0.0	sensitive fine grained
3.60	11.8	6.4	0.062	0.97	0.0	sensitive fine grained
3.70	12.1	6.6	0.058	0.87	0.0	sensitive fine grained
3.80	12.5	6.4	0.065	1.01	0.0	sensitive fine grained
3.90	12.8	6.4	0.063	0.98	0.0	sensitive fine grained
4.00	13.1	5.8	0.057	0.97	0.0	sensitive fine grained
4.10	13.5	6.2	0.062	1.01	0.0	sensitive fine grained
4.20	13.8	5.7	0.048	0.84	0.0	sensitive fine grained
4.30	14.1	5.9	0.041	0.70	0.0	sensitive fine grained
4.40	14.4	6.0	0.038	0.64	0.0	sensitive fine grained

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.50	14.8	6.7	0.059	0.89	0.0	sensitive fine grained
4.60	15.1	6.6	0.062	0.94	0.0	sensitive fine grained
4.70	15.4	6.8	0.064	0.95	0.0	sensitive fine grained
4.80	15.7	6.7	0.075	1.11	0.0	sensitive fine grained
4.90	16.1	6.8	0.063	0.92	0.0	sensitive fine grained
5.00	16.4	6.6	0.061	0.91	0.0	sensitive fine grained
5.10	16.7	6.4	0.041	0.63	0.0	sensitive fine grained
5.20	17.1	6.3	0.035	0.56	0.0	sensitive fine grained
5.30	17.4	6.7	0.037	0.55	0.0	sensitive fine grained
5.40	17.7	6.4	0.029	0.45	0.0	sensitive fine grained
5.50	18.0	7.4	0.034	0.46	0.0	sensitive fine grained
5.60	18.4	7.0	0.021	0.30	0.0	sensitive fine grained
5.70	18.7	6.8	0.024	0.35	0.0	sensitive fine grained
5.80	19.0	7.4	0.026	0.35	0.0	sensitive fine grained
5.90	19.4	7.5	0.034	0.46	0.0	sensitive fine grained
6.00	19.7	8.5	0.066	0.78	0.0	sensitive fine grained
6.10	20.0	8.5	0.062	0.73	0.0	clayey silt to silty clay
6.20	20.3	8.7	0.058	0.67	0.0	clayey silt to silty clay
6.30	20.7	8.8	0.071	0.81	0.0	clayey silt to silty clay
6.40	21.0	8.2	0.054	0.66	0.0	sensitive fine grained
6.50	21.3	8.2	0.074	0.91	0.0	clayey silt to silty clay
6.60	21.7	8.8	0.075	0.85	0.0	clayey silt to silty clay
6.70	22.0	9.3	0.086	0.92	0.0	clayey silt to silty clay
6.80	22.3	10.4	0.070	0.67	0.0	sandy silt to clayey silt
6.90	22.6	12.4	0.093	0.75	0.0	sandy silt to clayey silt
7.00	23.0	12.7	0.105	0.83	0.0	sandy silt to clayey silt
7.10	23.3	12.4	0.187	1.51	0.0	clayey silt to silty clay
7.20	23.6	11.3	0.152	1.35	0.0	clayey silt to silty clay
7.30	23.9	10.0	0.105	1.04	0.0	clayey silt to silty clay
7.40	24.3	8.9	0.155	1.73	0.0	clayey silt to silty clay
7.50	24.6	9.9	0.088	0.89	0.0	clayey silt to silty clay
7.60	24.9	8.3	0.070	0.84	0.0	clayey silt to silty clay
7.70	25.3	9.8	0.076	0.78	0.0	clayey silt to silty clay
7.80	25.6	8.5	0.090	1.05	0.0	clayey silt to silty clay
7.90	25.9	8.8	0.096	1.10	0.0	clayey silt to silty clay
8.00	26.2	8.5	0.068	0.80	0.0	clayey silt to silty clay
8.10	26.6	8.5	0.050	0.59	0.0	sensitive fine grained
8.20	26.9	8.2	0.043	0.53	0.0	sensitive fine grained
8.30	27.2	8.2	0.046	0.56	0.0	sensitive fine grained
8.40	27.6	8.8	0.076	0.87	0.0	clayey silt to silty clay
8.50	27.9	9.3	0.072	0.77	0.0	clayey silt to silty clay
8.60	28.2	9.0	0.039	0.44	0.0	sensitive fine grained
8.70	28.5	8.3	0.021	0.25	0.0	sensitive fine grained
8.80	28.9	7.5	0.022	0.30	0.0	sensitive fine grained
8.90	29.2	8.5	0.035	0.42	0.0	sensitive fine grained
9.00	29.5	8.1	0.033	0.41	0.0	sensitive fine grained
9.10	29.9	8.5	0.062	0.73	0.0	sensitive fine grained
9.20	30.2	9.4	0.078	0.83	0.0	clayey silt to silty clay
9.30	30.5	9.1	0.094	1.03	0.0	clayey silt to silty clay
9.40	30.8	8.8	0.136	1.54	0.0	clayey silt to silty clay

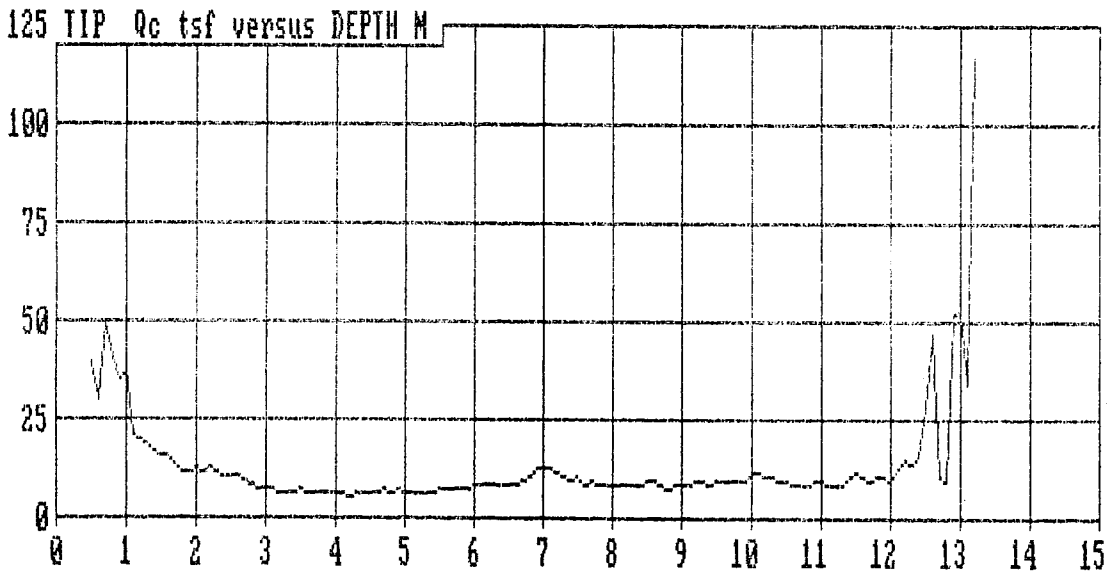
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.50	31.2	9.2	0.095	1.03	0.0	clayey silt to silty clay
9.60	31.5	8.9	0.088	0.99	0.0	clayey silt to silty clay
9.70	31.8	9.6	0.073	0.76	0.0	clayey silt to silty clay
9.80	32.2	8.9	0.076	0.88	0.0	clayey silt to silty clay
9.90	32.5	9.9	0.088	0.89	0.0	clayey silt to silty clay
10.00	32.8	11.0	0.122	1.11	0.0	clayey silt to silty clay
10.10	33.1	11.2	0.169	1.51	0.0	clayey silt to silty clay
10.20	33.5	10.8	0.189	1.75	0.0	clayey silt to silty clay
10.30	33.8	10.0	0.147	1.46	0.0	clayey silt to silty clay
10.40	34.1	9.2	0.154	1.66	0.0	clayey silt to silty clay
10.50	34.4	9.3	0.135	1.46	0.0	clayey silt to silty clay
10.60	34.8	8.3	0.086	1.04	0.0	clayey silt to silty clay
10.70	35.1	8.7	0.066	0.75	0.0	clayey silt to silty clay
10.80	35.4	8.5	0.048	0.56	0.0	sensitive fine grained
10.90	35.8	9.0	0.046	0.51	0.0	sensitive fine grained
11.00	36.1	9.0	0.042	0.47	0.0	sensitive fine grained
11.10	36.4	8.8	0.042	0.47	0.0	sensitive fine grained
11.20	36.7	8.8	0.045	0.51	0.0	sensitive fine grained
11.30	37.1	8.4	0.075	0.88	0.0	clayey silt to silty clay
11.40	37.4	10.1	0.164	1.62	0.0	clayey silt to silty clay
11.50	37.7	10.9	0.180	1.64	0.0	clayey silt to silty clay
11.60	38.1	10.1	0.157	1.56	0.0	clayey silt to silty clay
11.70	38.4	9.3	0.141	1.51	0.0	clayey silt to silty clay
11.80	38.7	10.3	0.159	1.54	0.0	clayey silt to silty clay
11.90	39.0	10.0	0.097	0.97	0.0	clayey silt to silty clay
12.00	39.4	9.7	0.091	0.94	0.0	clayey silt to silty clay
12.10	39.7	12.6	0.181	1.44	0.0	clayey silt to silty clay
12.20	40.0	15.0	0.355	2.39	0.1	clayey silt to silty clay
12.30	40.4	13.4	0.205	1.53	0.0	clayey silt to silty clay
12.40	40.7	15.6	0.352	2.26	0.0	clayey silt to silty clay
12.50	41.0	27.9	0.569	2.03	0.0	sandy silt to clayey silt
12.60	41.3	47.1	0.334	0.71	0.0	silty sand to sandy silt
12.70	41.7	10.2	0.131	1.28	0.0	sandy silt to clayey silt
12.80	42.0	8.9	0.118	1.33	0.0	sandy silt to clayey silt
12.90	42.3	52.1	0.578	1.11	0.0	silty sand to sandy silt
13.00	42.7	53.1	0.922	1.73	0.0	silty sand to sandy silt
13.10	43.0	34.0	0.632	1.86	0.0	?
13.20	43.3	117.0	?	?	0.0	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

SOUNDING DATA IN FILE SND100 06-29-94 15:55
OPERATOR : S.VAN LOCATION : P-6A/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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OPERATOR : S.VAN LOCATION : P-6A/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

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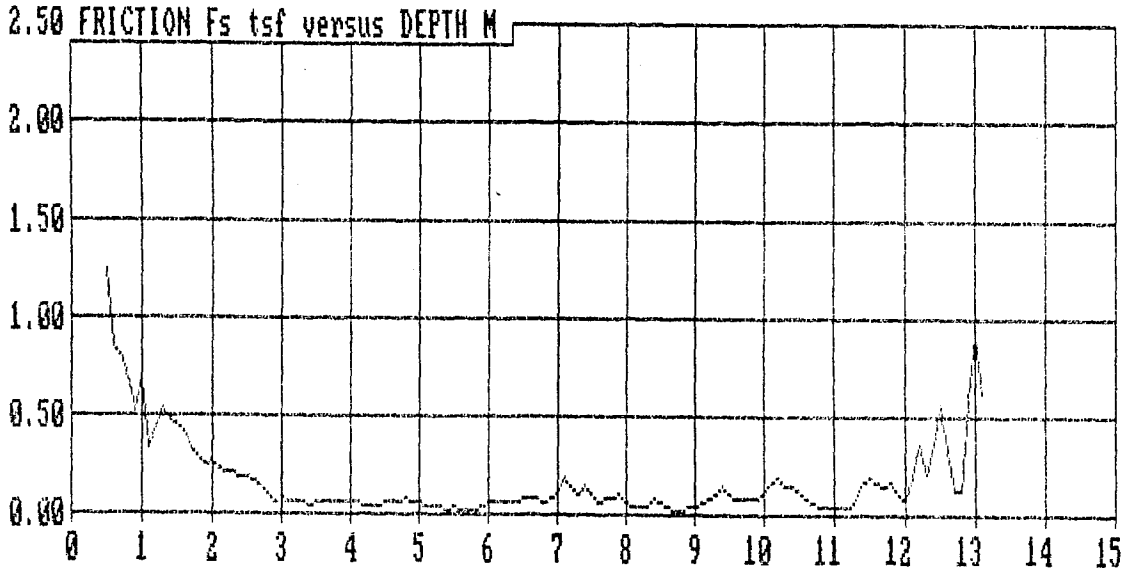

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OPERATOR : S.VAN LOCATION : P-6A/BFC-KC MO
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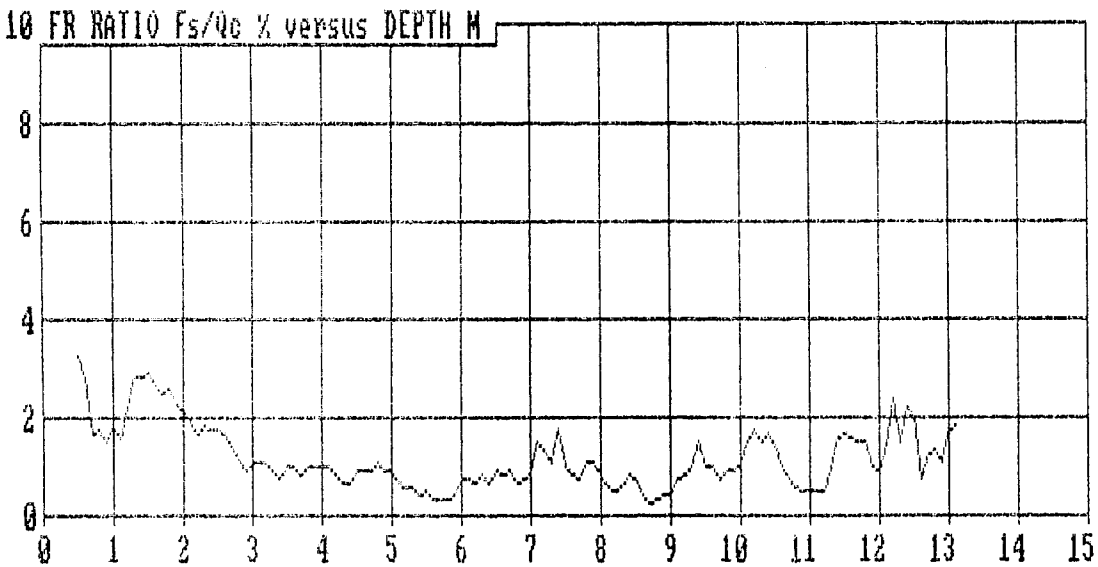
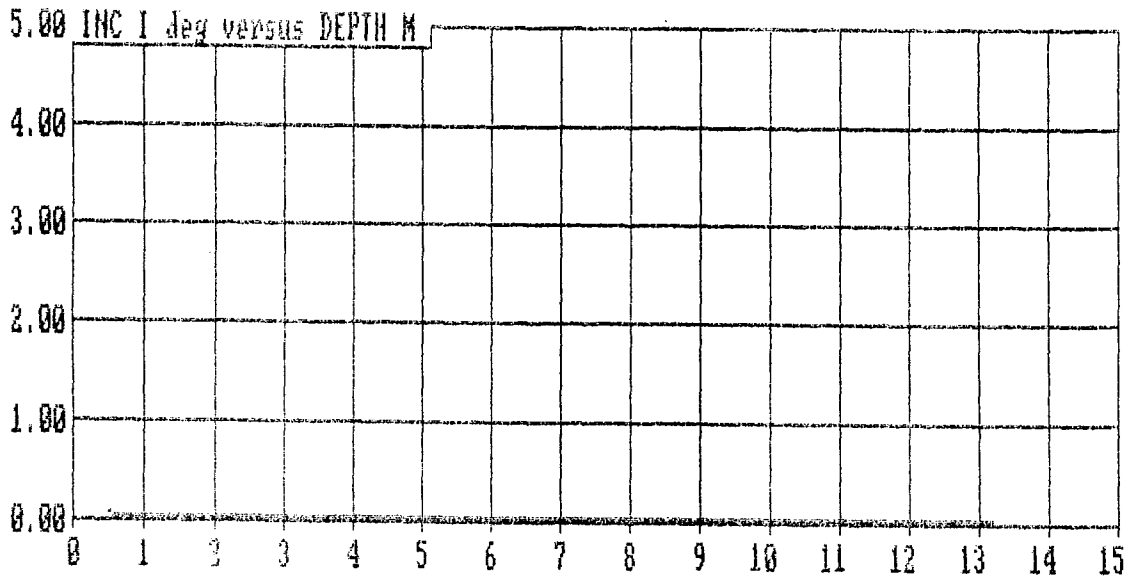
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND100 06-29-94 15:55
OPERATOR : S.VAN LOCATION : P-6A/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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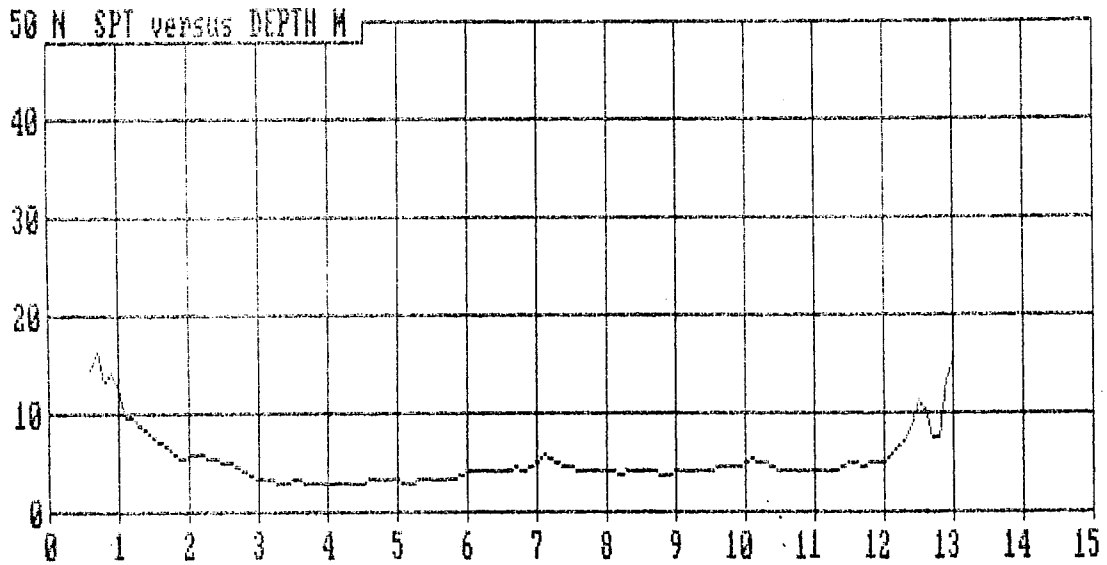
OPERATOR : S.VAN LOCATION : P-6A/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

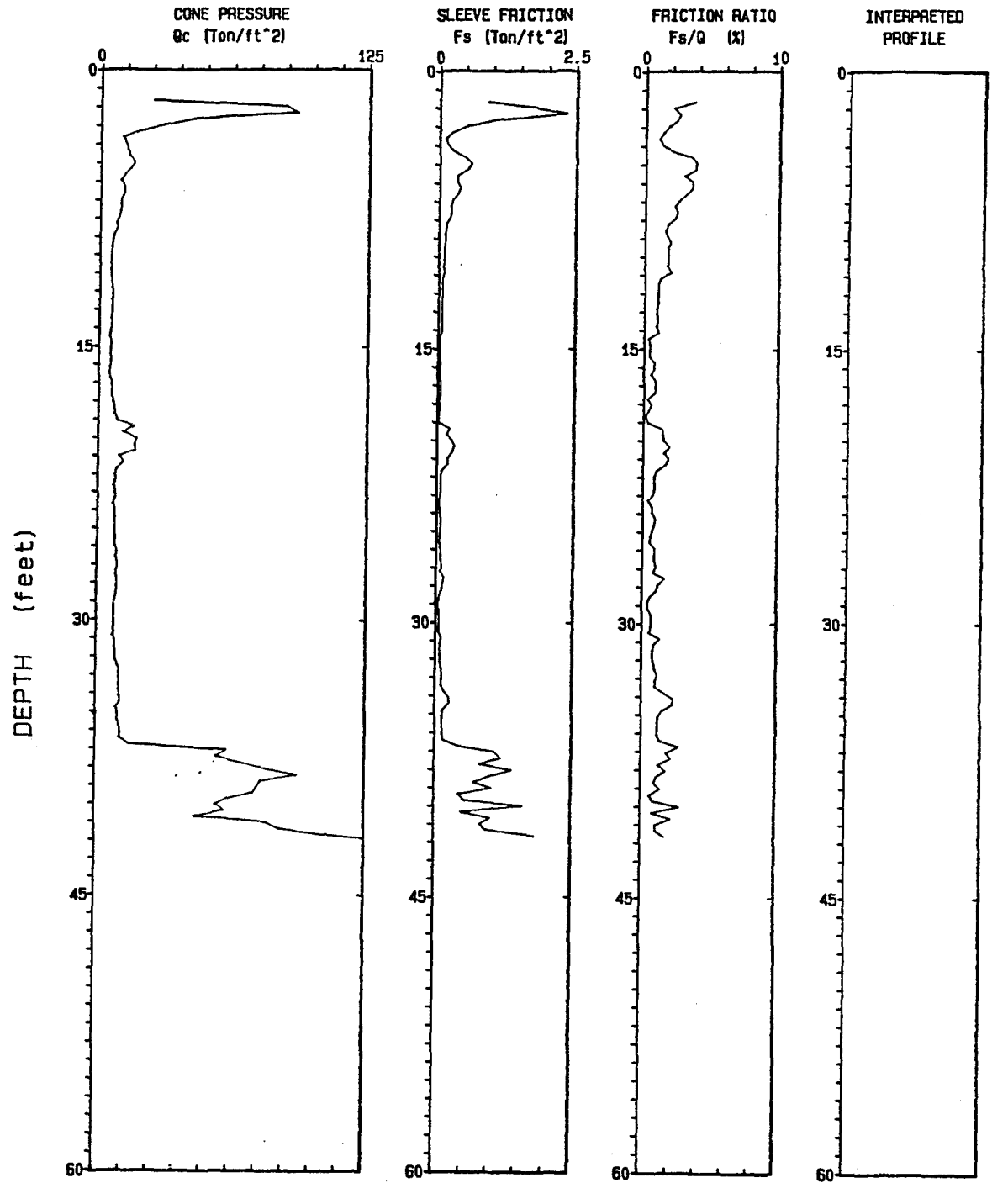


SCPT P-7

Vandeheey Soil Expl.

Operator : S.VAN
Sounding : SND101 Pg 1 / 1
Client : WES

CPT Date : 06-29-94 17:20
Location : P-7/8FC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 41.99 ft

SOUNDING DATA IN FILE SND101 06-29-94 17:20

OPERATOR : S.VAN LOCATION : P-7/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.50	1.6	25.0	0.908	3.64	0.5	?
0.60	2.0	86.5	1.779	2.06	0.0	sandy silt to clayey silt
0.70	2.3	91.7	2.323	2.53	0.1	sandy silt to clayey silt
0.80	2.6	44.0	0.993	2.25	0.0	sandy silt to clayey silt
0.90	3.0	29.3	0.491	1.68	0.1	sandy silt to clayey silt
1.00	3.3	17.7	0.224	1.27	0.1	sandy silt to clayey silt
1.10	3.6	10.4	0.103	0.99	0.1	sandy silt to clayey silt
1.20	3.9	11.9	0.152	1.27	0.1	clayey silt to silty clay
1.30	4.3	12.7	0.250	1.97	0.1	clayey silt to silty clay
1.40	4.6	13.2	0.456	3.46	0.1	silty clay to clay
1.50	4.9	15.6	0.589	3.77	0.1	silty clay to clay
1.60	5.2	14.0	0.517	3.68	0.1	silty clay to clay
1.70	5.6	11.3	0.323	2.85	0.1	silty clay to clay
1.80	5.9	9.2	0.320	3.49	0.1	silty clay to clay
1.90	6.2	11.0	0.382	3.46	0.1	silty clay to clay
2.00	6.6	11.0	0.328	2.97	0.1	silty clay to clay
2.10	6.9	9.5	0.240	2.51	0.1	silty clay to clay
2.20	7.2	9.5	0.204	2.16	0.1	silty clay to clay
2.30	7.5	9.3	0.222	2.38	0.1	silty clay to clay
2.40	7.9	8.6	0.187	2.18	0.1	silty clay to clay
2.50	8.2	7.4	0.123	1.67	0.0	clayey silt to silty clay
2.60	8.5	7.5	0.110	1.47	0.0	clayey silt to silty clay
2.70	8.9	6.5	0.107	1.66	0.0	silty clay to clay
2.80	9.2	5.8	0.111	1.91	0.0	silty clay to clay
2.90	9.5	5.5	0.092	1.67	0.0	silty clay to clay
3.00	9.8	5.2	0.088	1.70	0.0	sensitive fine grained
3.10	10.2	5.1	0.087	1.71	0.0	sensitive fine grained
3.20	10.5	4.9	0.081	1.67	0.0	silty clay to clay
3.30	10.8	5.2	0.103	1.98	0.0	sensitive fine grained
3.40	11.2	5.3	0.061	1.14	0.0	sensitive fine grained
3.50	11.5	5.7	0.054	0.94	0.0	sensitive fine grained
3.60	11.8	5.9	0.057	0.96	0.0	sensitive fine grained
3.70	12.1	6.2	0.057	0.92	0.0	sensitive fine grained
3.80	12.5	6.1	0.062	1.01	0.0	sensitive fine grained
3.90	12.8	6.2	0.054	0.86	0.0	sensitive fine grained
4.00	13.1	5.9	0.052	0.88	0.0	sensitive fine grained
4.10	13.5	5.4	0.052	0.96	0.0	sensitive fine grained
4.20	13.8	6.0	0.050	0.83	0.0	sensitive fine grained
4.30	14.1	5.3	0.055	1.04	0.0	sensitive fine grained
4.40	14.4	4.8	0.013	0.28	0.0	sensitive fine grained

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.50	14.8	6.0	0.026	0.43	0.0	sensitive fine grained
4.60	15.1	5.4	0.019	0.36	0.0	sensitive fine grained
4.70	15.4	5.3	0.021	0.39	0.0	sensitive fine grained
4.80	15.7	5.5	0.042	0.76	0.0	sensitive fine grained
4.90	16.1	5.2	0.041	0.79	0.0	sensitive fine grained
5.00	16.4	4.9	0.025	0.52	0.0	sensitive fine grained
5.10	16.7	5.4	0.047	0.87	0.0	sensitive fine grained
5.20	17.1	6.1	0.045	0.78	0.0	sensitive fine grained
5.30	17.4	6.2	0.047	0.76	0.0	sensitive fine grained
5.40	17.7	6.1	0.015	0.24	0.0	sensitive fine grained
5.50	18.0	7.1	0.040	0.56	0.0	sensitive fine grained
5.60	18.4	7.5	0.024	0.32	0.0	sensitive fine grained
5.70	18.7	7.8	0.006	0.08	0.0	sensitive fine grained
5.80	19.0	8.9	0.029	0.33	0.0	sandy silt to clayey silt
5.90	19.4	16.9	0.235	1.39	0.0	sandy silt to clayey silt
6.00	19.7	11.8	0.172	1.46	0.0	sandy silt to clayey silt
6.10	20.0	18.1	0.275	1.52	0.0	sandy silt to clayey silt
6.20	20.3	16.8	0.327	1.95	0.0	sandy silt to clayey silt
6.30	20.7	17.4	0.264	1.51	0.0	clayey silt to silty clay
6.40	21.0	9.8	0.183	1.86	0.0	clayey silt to silty clay
6.50	21.3	11.6	0.187	1.61	0.0	clayey silt to silty clay
6.60	21.7	8.9	0.086	0.96	0.0	clayey silt to silty clay
6.70	22.0	7.9	0.064	0.80	0.0	clayey silt to silty clay
6.80	22.3	8.3	0.067	0.80	0.0	sensitive fine grained
6.90	22.6	7.4	0.063	0.85	0.0	sensitive fine grained
7.00	23.0	8.2	0.057	0.70	0.0	sensitive fine grained
7.10	23.3	7.7	0.029	0.37	0.0	sensitive fine grained
7.20	23.6	7.1	0.048	0.68	0.0	sensitive fine grained
7.30	23.9	8.1	0.056	0.69	0.0	sensitive fine grained
7.40	24.3	7.8	0.072	0.93	0.0	sensitive fine grained
7.50	24.6	8.2	0.064	0.78	0.0	sensitive fine grained
7.60	24.9	7.6	0.050	0.65	0.0	sensitive fine grained
7.70	25.3	7.8	0.041	0.52	0.0	sensitive fine grained
7.80	25.6	8.3	0.045	0.54	0.0	sensitive fine grained
7.90	25.9	8.3	0.076	0.91	0.0	clayey silt to silty clay
8.00	26.2	9.3	0.078	0.83	0.0	clayey silt to silty clay
8.10	26.6	8.7	0.072	0.82	0.0	clayey silt to silty clay
8.20	26.9	9.5	0.095	1.00	0.0	clayey silt to silty clay
8.30	27.2	9.0	0.074	0.82	0.0	clayey silt to silty clay
8.40	27.6	8.9	0.146	1.65	0.0	clayey silt to silty clay
8.50	27.9	9.6	0.109	1.14	0.0	clayey silt to silty clay
8.60	28.2	9.4	0.095	1.01	0.0	clayey silt to silty clay
8.70	28.5	9.0	0.049	0.54	0.0	clayey silt to silty clay
8.80	28.9	8.4	0.033	0.39	0.0	sensitive fine grained
8.90	29.2	7.9	0.035	0.44	0.0	sensitive fine grained
9.00	29.5	7.8	0.052	0.66	0.0	sensitive fine grained
9.10	29.9	7.8	0.053	0.68	0.0	sensitive fine grained
9.20	30.2	7.9	0.048	0.60	0.0	sensitive fine grained
9.30	30.5	7.7	0.041	0.54	0.0	sensitive fine grained
9.40	30.8	7.8	0.105	1.34	0.0	clayey silt to silty clay

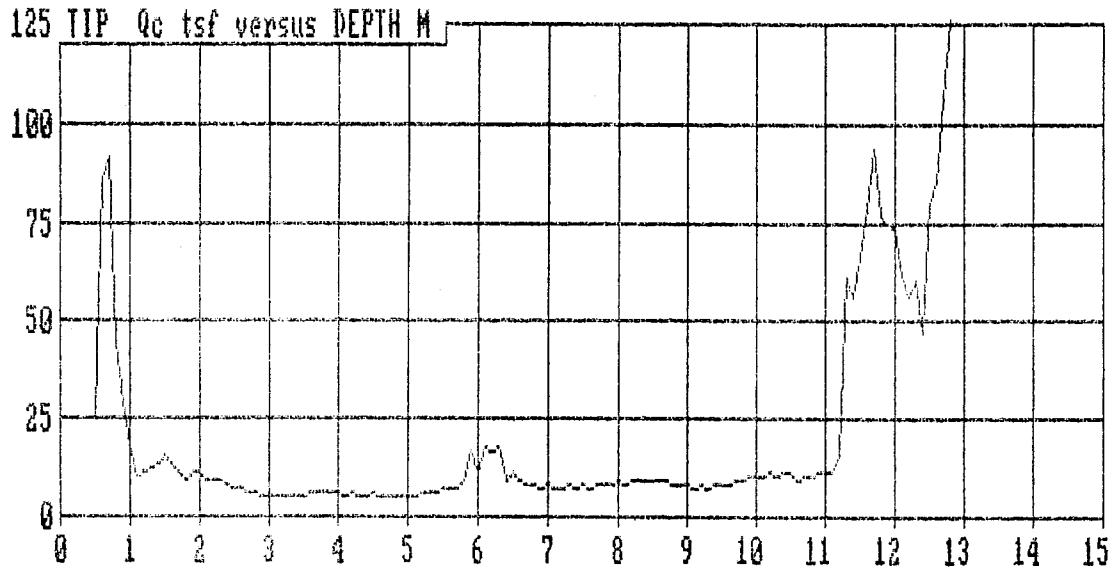
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.50	31.2	8.8	0.074	0.84	0.0	clayey silt to silty clay
9.60	31.5	8.6	0.067	0.78	0.0	clayey silt to silty clay
9.70	31.8	9.1	0.066	0.73	0.0	clayey silt to silty clay
9.80	32.2	8.9	0.077	0.87	0.0	clayey silt to silty clay
9.90	32.5	10.0	0.095	0.95	0.0	clayey silt to silty clay
10.00	32.8	10.9	0.128	1.18	0.0	clayey silt to silty clay
10.10	33.1	10.8	0.109	1.01	0.0	clayey silt to silty clay
10.20	33.5	10.9	0.106	0.97	0.0	clayey silt to silty clay
10.30	33.8	10.6	0.171	1.61	0.0	clayey silt to silty clay
10.40	34.1	11.1	0.259	2.33	0.0	clayey silt to silty clay
10.50	34.4	11.3	0.262	2.32	0.0	clayey silt to silty clay
10.60	34.8	9.6	0.145	1.55	0.0	clayey silt to silty clay
10.70	35.1	10.2	0.121	1.19	0.0	clayey silt to silty clay
10.80	35.4	10.0	0.113	1.13	0.0	clayey silt to silty clay
10.90	35.8	10.9	0.128	1.17	0.0	clayey silt to silty clay
11.00	36.1	11.5	0.125	1.10	0.0	clayey silt to silty clay
11.10	36.4	11.2	0.157	1.40	0.0	clayey silt to silty clay
11.20	36.7	15.6	0.431	2.77	0.0	sandy silt to clayey silt
11.30	37.1	61.4	1.128	1.84	0.0	sandy silt to clayey silt
11.40	37.4	56.1	1.228	2.19	0.0	silty sand to sandy silt
11.50	37.7	67.0	0.846	1.26	0.0	silty sand to sandy silt
11.60	38.1	79.2	1.442	1.82	0.0	silty sand to sandy silt
11.70	38.4	93.8	1.027	1.09	0.0	sand to silty sand
11.80	38.7	77.1	0.731	0.95	0.0	sand to silty sand
11.90	39.0	75.1	1.067	1.42	0.0	sand to silty sand
12.00	39.4	73.5	0.437	0.59	0.1	sand to silty sand
12.10	39.7	61.7	0.565	0.92	0.1	silty sand to sandy silt
12.20	40.0	56.5	1.640	2.90	0.1	silty sand to sandy silt
12.30	40.4	60.4	0.504	0.83	0.1	silty sand to sandy silt
12.40	40.7	46.9	1.047	2.23	0.1	silty sand to sandy silt
12.50	41.0	80.0	0.854	1.07	0.1	silty sand to sandy silt
12.60	41.3	85.6	0.968	1.13	0.1	sand to silty sand
12.70	41.7	106.1	1.851	1.74	0.1	?
12.80	42.0	135.7	?	?	0.5	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

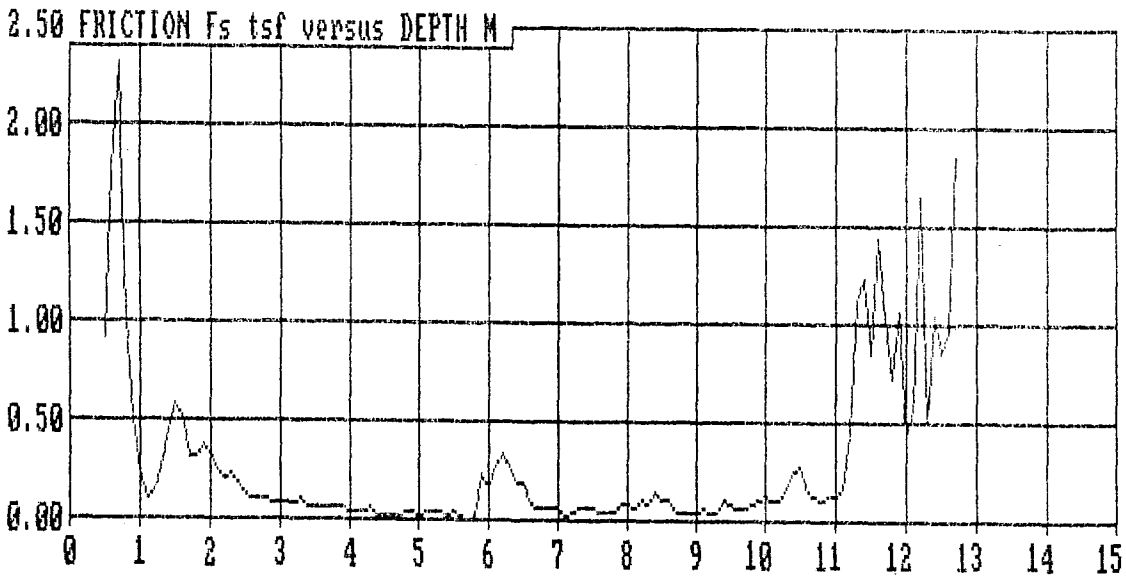
SOUNDING DATA IN FILE SND101 06-29-94 17:20
OPERATOR : S.VAN LOCATION : P-7/BFC-KC NO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



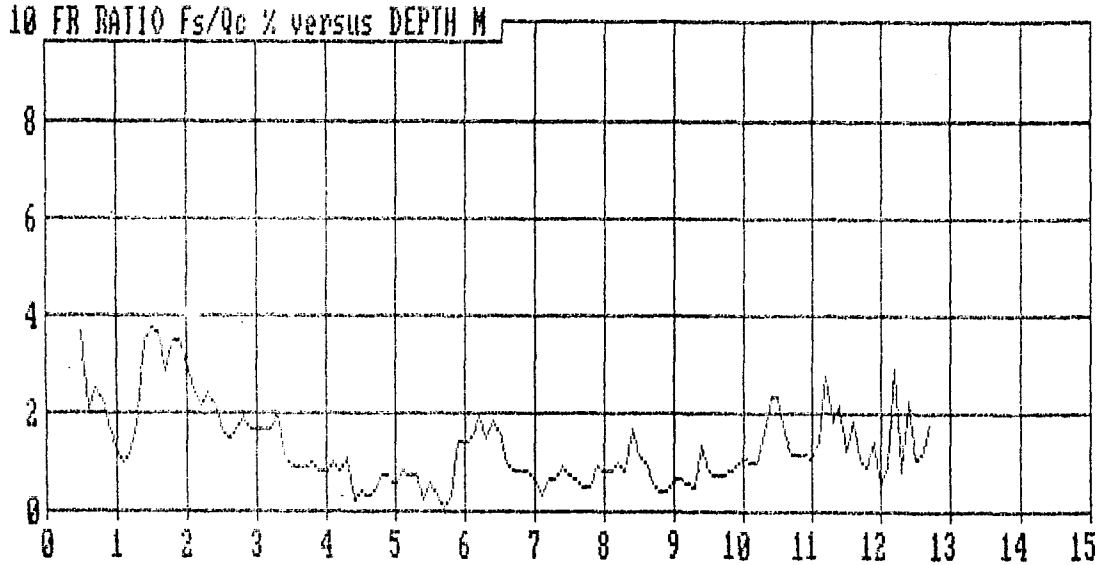
SOUNDING DATA IN FILE SND101 06-29-94 17:20
OPERATOR : S.VAN LOCATION : P-7/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND101 06-29-94 17:20
OPERATOR : S.VAN LOCATION : P-7/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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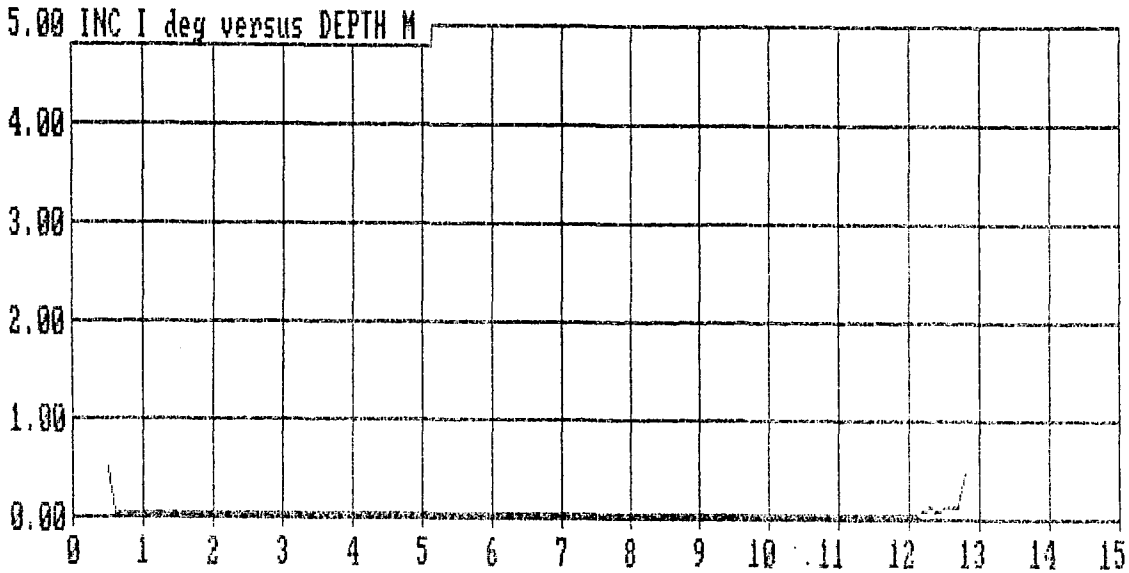
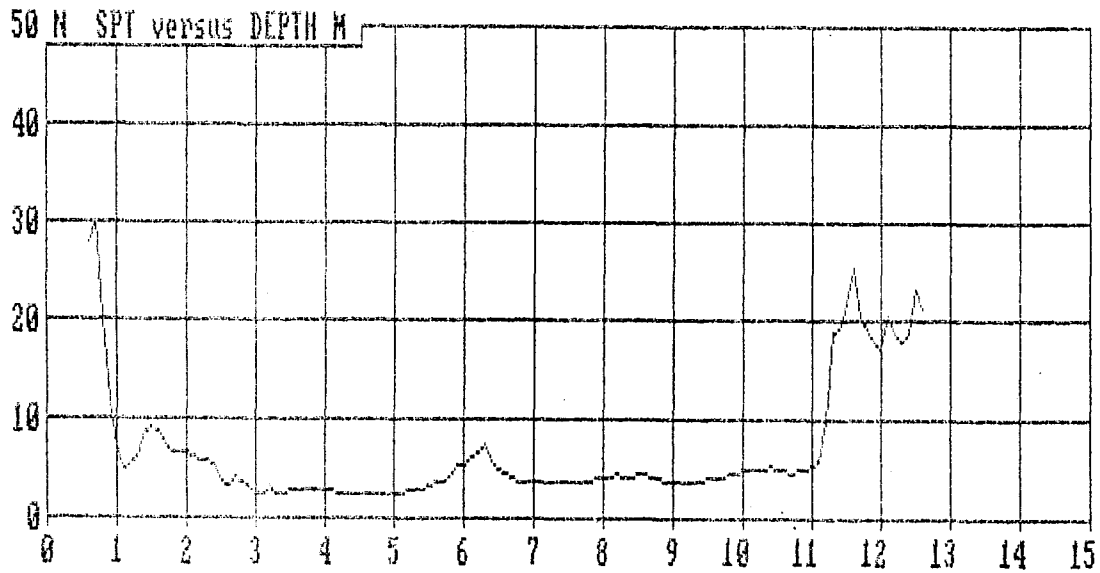
OPERATOR : S.VAN LOCATION : P-7/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon, 97106 (503) 324 3261



SOUNDING DATA IN FILE SND101 06-29-94 17:20
OPERATOR : S.VAN LOCATION : P-7/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

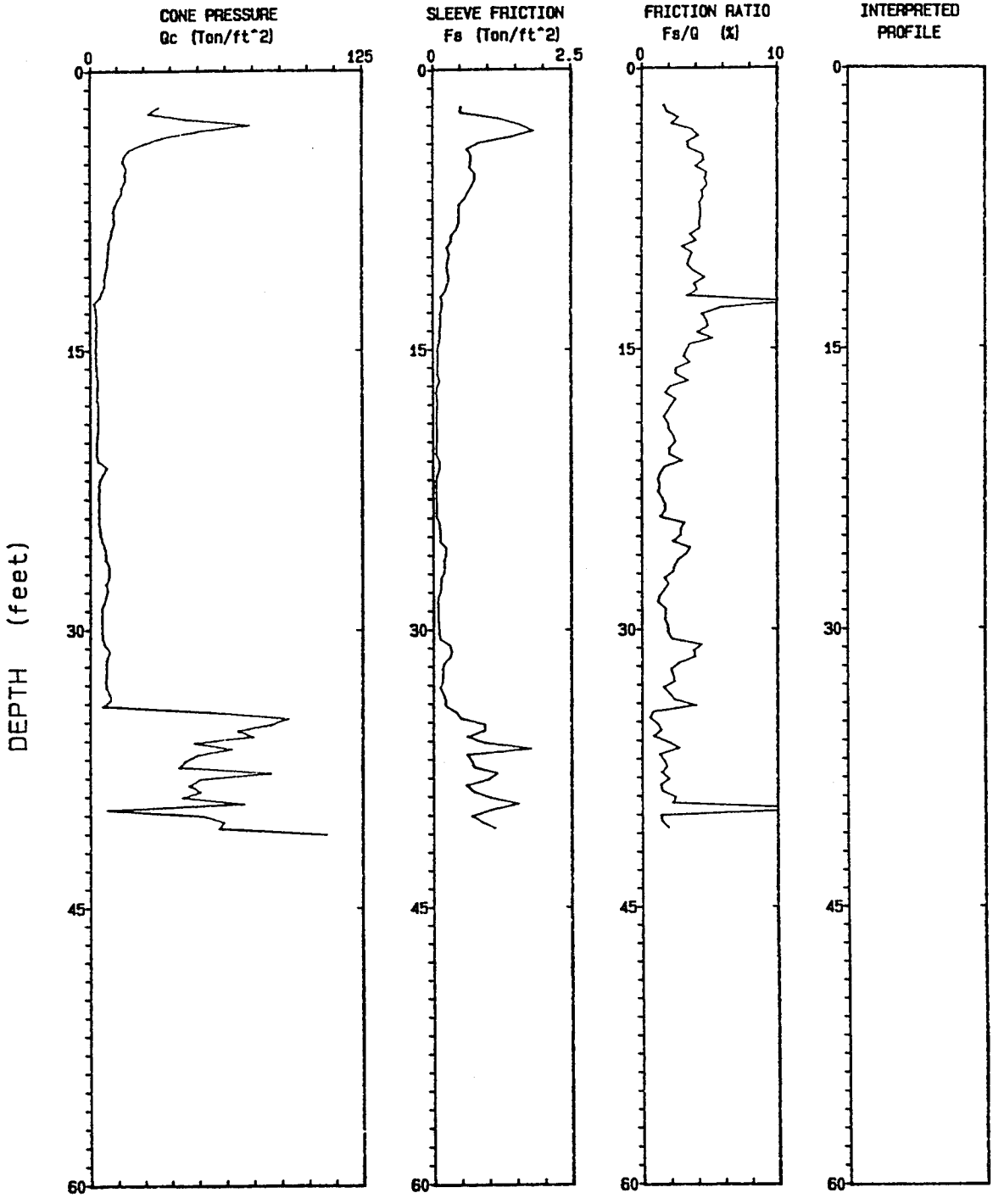


SCPT P-8

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND-93 Pg 1 / 1
Client : WES

CPT Date : 06-27-94 18:52
Location : P-8/BFC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 41.01 ft

SOUNDING DATA IN FILE SND-93 06-27-94 18:52

OPERATOR : S.VAN LOCATION : P-8/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.60	2.0	32.1	0.520	1.62	0.1	?
0.70	2.3	27.3	0.502	1.84	0.1	sandy silt to clayey silt
0.80	2.6	44.8	1.208	2.70	0.1	sandy silt to clayey silt
0.90	3.0	73.7	1.580	2.14	0.1	sandy silt to clayey silt
1.00	3.3	49.4	1.830	3.71	0.1	clayey silt to silty clay
1.10	3.6	33.8	1.419	4.19	0.1	clayey silt to silty clay
1.20	3.9	24.9	0.827	3.32	0.1	clayey silt to silty clay
1.30	4.3	18.1	0.620	3.43	0.1	silty clay to clay
1.40	4.6	15.7	0.701	4.47	0.1	clay
1.50	4.9	15.2	0.695	4.58	0.0	clay
1.60	5.2	17.0	0.668	3.94	0.1	clay
1.70	5.6	16.1	0.770	4.80	0.1	clay
1.80	5.9	16.4	0.761	4.63	0.1	clay
1.90	6.2	14.6	0.707	4.83	0.1	clay
2.00	6.6	14.5	0.638	4.39	0.1	clay
2.10	6.9	12.9	0.579	4.51	0.1	clay
2.20	7.2	11.5	0.481	4.20	0.1	clay
2.30	7.5	10.8	0.470	4.36	0.1	clay
2.40	7.9	11.0	0.474	4.33	0.1	clay
2.50	8.2	11.2	0.473	4.21	0.1	clay
2.60	8.5	9.9	0.426	4.29	0.1	clay
2.70	8.9	9.5	0.335	3.54	0.1	clay
2.80	9.2	8.2	0.329	4.02	0.1	clay
2.90	9.5	8.5	0.252	2.96	0.0	clay
3.00	9.8	8.0	0.300	3.73	0.0	clay
3.10	10.2	7.8	0.269	3.46	0.0	clay
3.20	10.5	7.5	0.253	3.37	0.0	clay
3.30	10.8	6.9	0.272	3.92	0.0	clay
3.40	11.2	6.4	0.300	4.67	0.0	clay
3.50	11.5	6.6	0.256	3.86	0.1	clay
3.60	11.8	5.4	0.224	4.11	0.1	clay
3.70	12.1	4.2	0.140	3.33	0.1	clay
3.80	12.5	1.5	0.171	11.31	0.1	organic material
3.90	12.8	2.6	0.152	5.82	0.1	organic material
4.00	13.1	2.8	0.126	4.44	0.1	clay
4.10	13.5	2.8	0.132	4.79	0.1	clay
4.20	13.8	2.7	0.133	4.94	0.0	clay
4.30	14.1	2.8	0.113	4.08	0.1	clay
4.40	14.4	2.3	0.123	5.28	0.0	clay
4.50	14.8	2.5	0.089	3.51	0.1	clay

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.60	15.1	2.3	0.073	3.25	0.1	clay
4.70	15.4	2.6	0.080	3.07	0.1	clay
4.80	15.7	2.5	0.090	3.58	0.1	clay
4.90	16.1	3.0	0.073	2.45	0.1	clay
5.00	16.4	3.0	0.076	2.53	0.1	clay
5.10	16.7	3.5	0.123	3.48	0.1	clay
5.20	17.1	3.2	0.065	2.04	0.1	clay
5.30	17.4	3.0	0.051	1.71	0.1	sensitive fine grained
5.40	17.7	3.0	0.074	2.50	0.1	clay
5.50	18.0	3.8	0.081	2.13	0.0	clay
5.60	18.4	3.5	0.065	1.87	0.0	sensitive fine grained
5.70	18.7	3.5	0.056	1.59	0.0	sensitive fine grained
5.80	19.0	3.2	0.062	1.93	0.1	sensitive fine grained
5.90	19.4	3.7	0.073	1.99	0.0	clay
6.00	19.7	3.1	0.071	2.31	0.0	clay
6.10	20.0	2.8	0.068	2.46	0.0	clay
6.20	20.3	2.8	0.056	2.00	0.0	sensitive fine grained
6.30	20.7	2.7	0.054	2.00	0.0	clay
6.40	21.0	3.8	0.114	2.98	0.0	clay
6.50	21.3	7.8	0.127	1.62	0.0	silty clay to clay
6.60	21.7	5.8	0.077	1.32	0.0	sensitive fine grained
6.70	22.0	4.3	0.049	1.14	0.0	sensitive fine grained
6.80	22.3	3.8	0.050	1.31	0.0	sensitive fine grained
6.90	22.6	4.0	0.046	1.16	0.0	sensitive fine grained
7.00	23.0	3.8	0.056	1.48	0.0	sensitive fine grained
7.10	23.3	4.0	0.068	1.72	0.0	sensitive fine grained
7.20	23.6	3.8	0.064	1.67	0.0	sensitive fine grained
7.30	23.9	3.9	0.052	1.33	0.0	sensitive fine grained
7.40	24.3	3.8	0.119	3.12	0.1	clay
7.50	24.6	4.5	0.127	2.81	0.0	clay
7.60	24.9	4.8	0.135	2.83	0.0	clay
7.70	25.3	5.7	0.130	2.27	0.0	clay
7.80	25.6	6.8	0.241	3.56	0.0	clay
7.90	25.9	7.3	0.235	3.24	0.0	clay
8.00	26.2	7.3	0.193	2.63	0.0	silty clay to clay
8.10	26.6	8.8	0.207	2.36	0.0	silty clay to clay
8.20	26.9	8.8	0.197	2.23	0.0	silty clay to clay
8.30	27.2	8.4	0.136	1.62	0.0	clayey silt to silty clay
8.40	27.6	7.1	0.137	1.93	0.0	clayey silt to silty clay
8.50	27.9	8.0	0.127	1.59	0.1	clayey silt to silty clay
8.60	28.2	7.1	0.087	1.23	0.1	sensitive fine grained
8.70	28.5	6.3	0.072	1.14	0.1	sensitive fine grained
8.80	28.9	5.1	0.088	1.71	0.1	sensitive fine grained
8.90	29.2	5.3	0.091	1.72	0.1	sensitive fine grained
9.00	29.5	5.2	0.088	1.70	0.1	silty clay to clay
9.10	29.9	5.3	0.103	1.92	0.1	silty clay to clay
9.20	30.2	5.4	0.102	1.90	0.1	silty clay to clay
9.30	30.5	5.8	0.126	2.17	0.1	clay
9.40	30.8	6.8	0.299	4.39	0.1	clay
9.50	31.2	9.0	0.339	3.77	0.0	clay

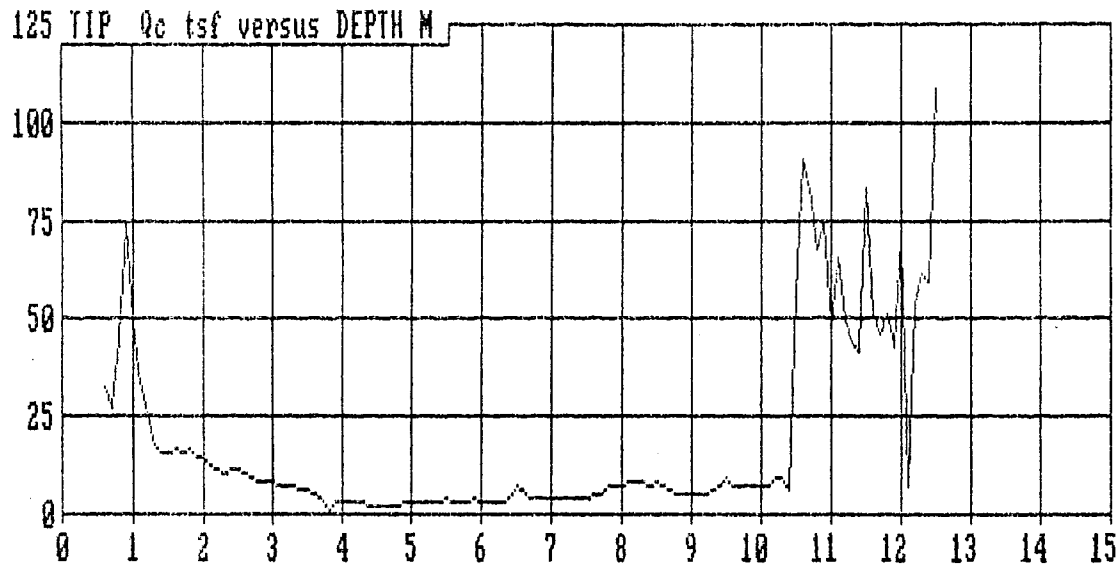
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 a sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.60	31.5	7.7	0.303	3.91	0.0	clay
9.70	31.8	7.2	0.191	2.67	0.0	silty clay to clay
9.80	32.2	7.6	0.160	2.09	0.0	silty clay to clay
9.90	32.5	7.4	0.167	2.26	0.0	silty clay to clay
10.00	32.8	7.0	0.167	2.40	0.0	silty clay to clay
10.10	33.1	7.5	0.116	1.54	0.0	silty clay to clay
10.20	33.5	9.0	0.179	1.99	0.0	clayey silt to silty clay
10.30	33.8	9.5	0.22[illegible]	2.35	0.0	silty clay to clay
10.40	34.1	5.7	0.229	3.99	0.0	sandy silt to clayey silt
10.50	34.4	55.5	0.422	0.76	0.0	silty sand to sandy silt
10.60	34.8	91.1	0.506	0.56	0.0	sand to silty sand
10.70	35.1	83.0	0.939	1.13	0.0	sand to silty sand
10.80	35.4	68.0	0.939	1.38	0.0	silty sand to sandy silt
10.90	35.8	75.2	0.625	0.83	0.0	silty sand to sandy silt
11.00	36.1	48.3	0.944	1.96	0.0	silty sand to sandy silt
11.10	36.4	65.2	1.772	2.72	0.0	sandy silt to clayey silt
11.20	36.7	49.3	0.614	1.25	0.0	silty sand to sandy silt
11.30	37.1	43.9	0.702	1.60	0.0	silty sand to sandy silt
11.40	37.4	41.3	0.748	1.81	0.0	silty sand to sandy silt
11.50	37.7	83.2	1.162	1.40	0.0	silty sand to sandy silt
11.60	38.1	50.6	1.004	1.98	0.0	silty sand to sandy silt
11.70	38.4	45.9	0.602	1.31	0.0	silty sand to sandy silt
11.80	38.7	50.9	0.739	1.45	0.0	silty sand to sandy silt
11.90	39.0	42.9	1.047	2.44	0.0	sandy silt to clayey silt
12.00	39.4	70.8	1.551	2.19	0.0	sandy silt to clayey silt
12.10	39.7	7.7	1.047	13.57	0.0	clayey silt to silty clay
12.20	40.0	52.7	0.703	1.33	0.0	sandy silt to clayey silt
12.30	40.4	61.7	0.889	1.44	0.0	silty sand to sandy silt
12.40	40.7	59.4	1.124	1.89	0.2	?
12.50	41.0	108.7	?	?	0.2	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

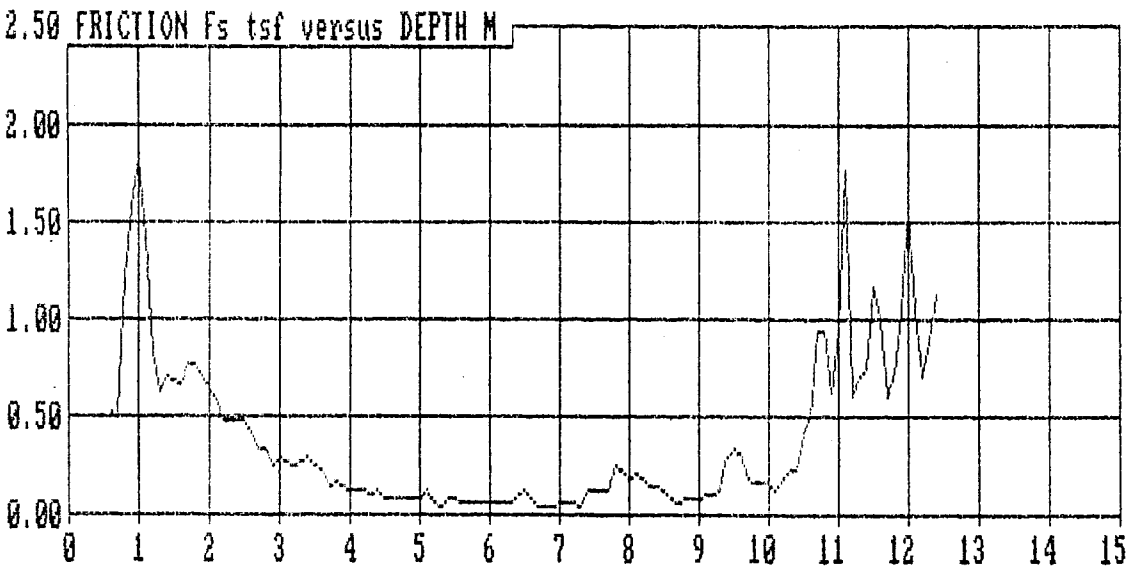
SOUNDING DATA IN FILE SND-93 06-27-94 18:52
OPERATOR : S.VAN LOCATION : P-8/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND-93 06-27-94 18:52
OPERATOR : S.VAN LOCATION : P-8/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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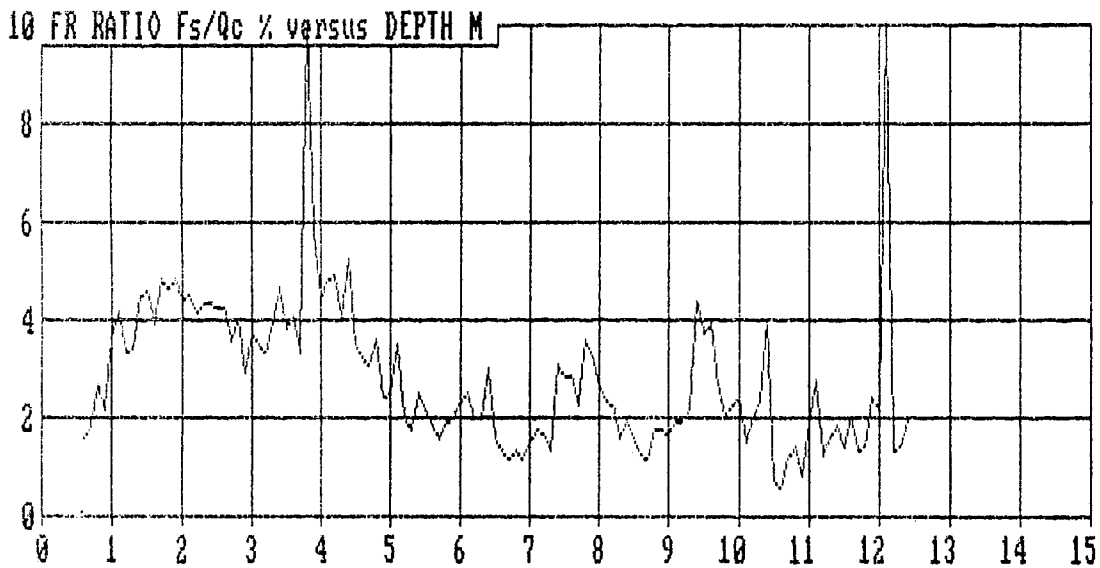
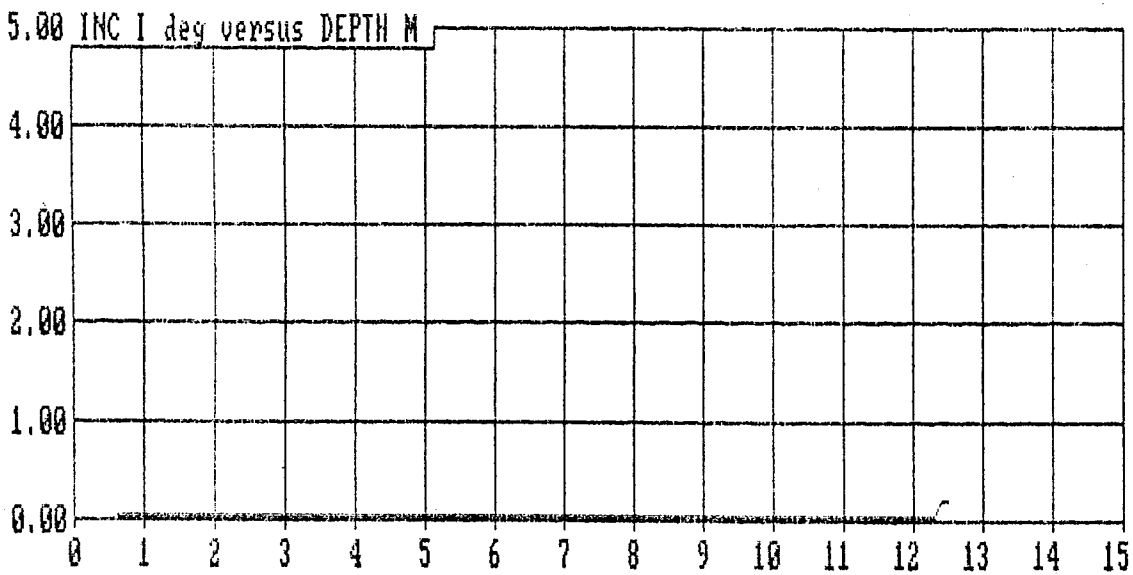
OPERATOR : S.VAN LOCATION : P-8/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND-93 06-27-94 18:52
OPERATOR : S.VAN LOCATION : P-8/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

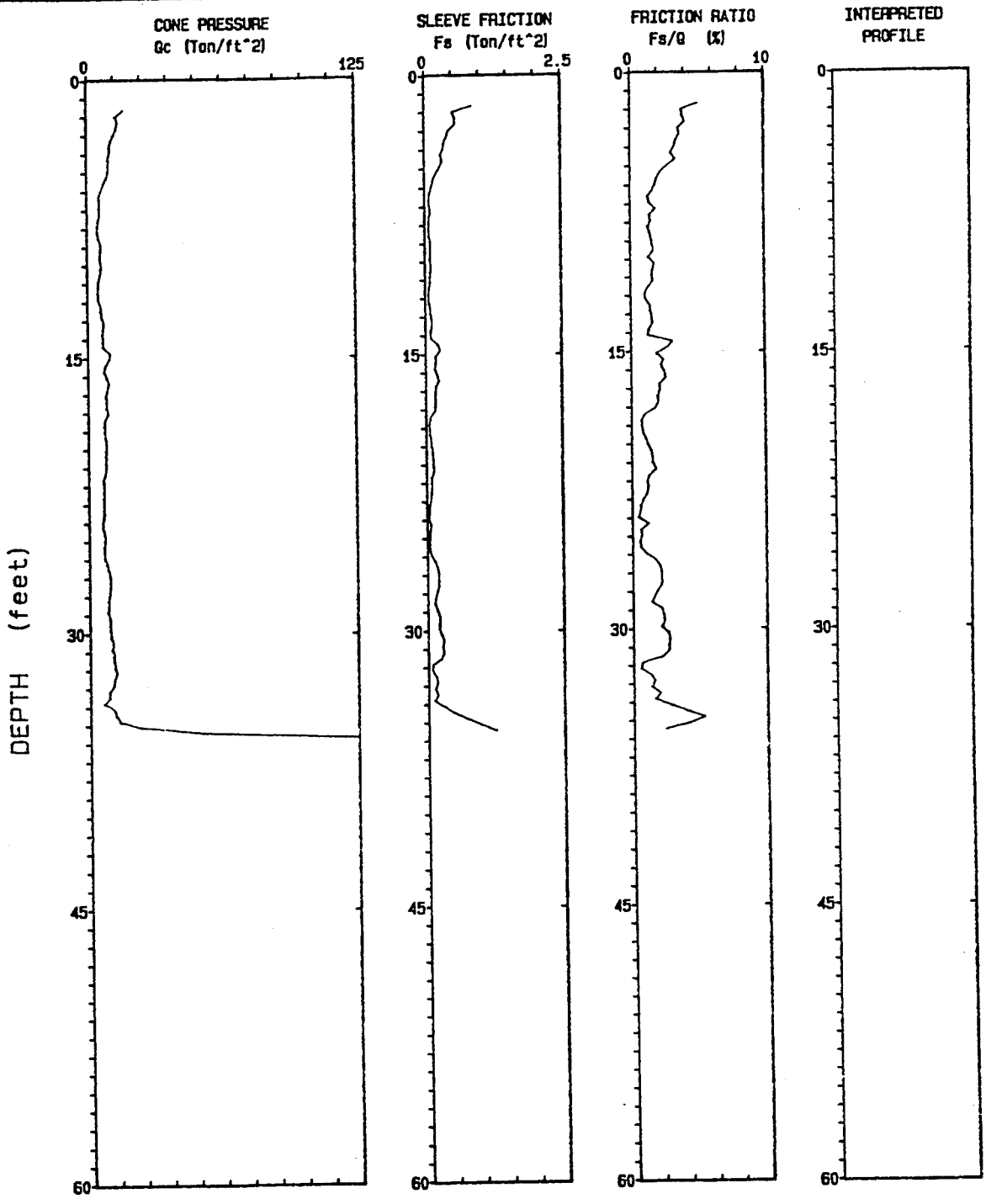


SCPT P-9

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND-94 Pg 1 / 1
Client : WES

CPT Date : 06-27-94 21:24
Location : P-9/BFC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 35.76 ft

SOUNDING DATA IN FILE SND-94 06-27-94 21:24

OPERATOR : S.VAN LOCATION : P-9/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3361

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.50	1.6	17.3	0.870	5.04	0.0	?
0.60	2.0	13.6	0.517	3.80	0.0	clay
0.70	2.3	14.7	0.574	3.91	0.0	silty clay to clay
0.80	2.6	13.9	0.565	4.08	0.0	clay
0.90	3.0	12.6	0.446	3.54	0.0	silty clay to clay
1.00	3.3	11.1	0.408	3.67	0.0	silty clay to clay
1.10	3.6	10.6	0.357	3.38	0.0	silty clay to clay
1.20	3.9	10.6	0.343	3.24	0.0	silty clay to clay
1.30	4.3	9.9	0.296	2.98	0.0	silty clay to clay
1.40	4.6	9.9	0.335	3.37	0.0	silty clay to clay
1.50	4.9	10.0	0.272	2.73	0.0	silty clay to clay
1.60	5.2	9.0	0.200	2.22	0.0	silty clay to clay
1.70	5.6	7.7	0.151	1.96	0.0	silty clay to clay
1.80	5.9	6.6	0.120	1.82	0.0	silty clay to clay
1.90	6.2	5.5	0.089	1.62	0.0	sensitive fine grained
2.00	6.6	5.6	0.071	1.27	0.0	sensitive fine grained
2.10	6.9	5.9	0.084	1.43	0.0	sensitive fine grained
2.20	7.2	5.7	0.107	1.88	0.0	sensitive fine grained
2.30	7.5	5.1	0.071	1.39	0.0	sensitive fine grained
2.40	7.9	4.5	0.069	1.52	0.0	sensitive fine grained
2.50	8.2	4.7	0.060	1.29	0.0	sensitive fine grained
2.60	8.5	5.4	0.078	1.45	0.0	sensitive fine grained
2.70	8.9	6.5	0.100	1.56	0.0	sensitive fine grained
2.80	9.2	6.1	0.100	1.64	0.0	silty clay to clay
2.90	9.5	5.6	0.096	1.70	0.0	sensitive fine grained
3.00	9.8	6.3	0.082	1.29	0.0	sensitive fine grained
3.10	10.2	6.5	0.113	1.75	0.0	silty clay to clay
3.20	10.5	5.8	0.095	1.63	0.0	sensitive fine grained
3.30	10.8	5.0	0.078	1.54	0.0	sensitive fine grained
3.40	11.2	4.7	0.078	1.66	0.0	sensitive fine grained
3.50	11.5	4.6	0.059	1.29	0.0	sensitive fine grained
3.60	11.8	4.9	0.050	1.02	0.0	sensitive fine grained
3.70	12.1	5.9	0.060	1.02	0.0	sensitive fine grained
3.80	12.5	6.4	0.088	1.39	0.0	sensitive fine grained
3.90	12.8	6.6	0.097	1.47	0.0	sensitive fine grained
4.00	13.1	7.6	0.120	1.56	0.0	clayey silt to silty clay
4.10	13.5	7.2	0.115	1.60	0.0	clayey silt to silty clay
4.20	13.8	6.7	0.087	1.30	0.0	sensitive fine grained
4.30	14.1	7.1	0.086	1.21	0.0	silty clay to clay
4.40	14.4	7.2	0.221	3.06	0.0	silty clay to clay

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.50	14.8	10.5	0.275	2.63	0.0	silty clay to clay
4.60	15.1	9.7	0.178	1.84	0.0	clayey silt to silty clay
4.70	15.4	7.9	0.187	2.36	0.0	silty clay to clay
4.80	15.7	7.4	0.158	2.14	0.0	silty clay to clay
4.90	16.1	8.8	0.214	2.44	0.0	silty clay to clay
5.00	16.4	9.7	0.246	2.53	0.0	silty clay to clay
5.10	16.7	8.8	0.177	2.02	0.0	silty clay to clay
5.20	17.1	8.1	0.170	2.09	0.0	silty clay to clay
5.30	17.4	8.5	0.163	1.91	0.0	silty clay to clay
5.40	17.7	8.4	0.167	1.98	0.0	clayey silt to silty clay
5.50	18.0	9.3	0.157	1.70	0.0	clayey silt to silty clay
5.60	18.4	7.6	0.071	0.93	0.0	clayey silt to silty clay
5.70	18.7	7.3	0.050	0.69	0.0	sensitive fine grained
5.80	19.0	7.4	0.056	0.75	0.0	sensitive fine grained
5.90	19.4	8.0	0.067	0.84	0.0	sensitive fine grained
6.00	19.7	8.5	0.089	1.04	0.0	clayey silt to silty clay
6.10	20.0	8.2	0.098	1.19	0.0	clayey silt to silty clay
6.20	20.3	8.0	0.115	1.44	0.0	clayey silt to silty clay
6.30	20.7	8.1	0.124	1.53	0.0	clayey silt to silty clay
6.40	21.0	8.0	0.125	1.56	0.0	clayey silt to silty clay
6.50	21.3	7.6	0.137	1.80	0.0	clayey silt to silty clay
6.60	21.7	6.8	0.084	1.24	0.0	clayey silt to silty clay
6.70	22.0	7.3	0.079	1.09	0.0	sensitive fine grained
6.80	22.3	7.0	0.084	1.19	0.0	sensitive fine grained
6.90	22.6	7.1	0.076	1.07	0.0	sensitive fine grained
7.00	23.0	6.8	0.054	0.80	0.0	sensitive fine grained
7.10	23.3	6.9	0.041	0.59	0.0	sensitive fine grained
7.20	23.6	7.0	0.039	0.56	0.0	sensitive fine grained
7.30	23.9	6.3	0.027	0.42	0.0	sensitive fine grained
7.40	24.3	6.2	0.074	1.20	0.0	sensitive fine grained
7.50	24.6	7.3	0.043	0.59	0.0	sensitive fine grained
7.60	24.9	7.4	0.050	0.68	0.0	sensitive fine grained
7.70	25.3	6.9	0.036	0.52	0.0	sensitive fine grained
7.80	25.6	6.8	0.041	0.61	0.0	sensitive fine grained
7.90	25.9	7.2	0.075	1.04	0.0	sensitive fine grained
8.00	26.2	8.4	0.143	1.70	0.0	clayey silt to silty clay
8.10	26.6	8.9	0.181	2.02	0.0	clayey silt to silty clay
8.20	26.9	9.8	0.209	2.13	0.0	clayey silt to silty clay
8.30	27.2	9.6	0.203	2.11	0.0	clayey silt to silty clay
8.40	27.6	9.6	0.205	2.15	0.0	clayey silt to silty clay
8.50	27.9	9.1	0.167	1.83	0.0	clayey silt to silty clay
8.60	28.2	8.6	0.135	1.57	0.0	clayey silt to silty clay
8.70	28.5	8.9	0.123	1.38	0.0	clayey silt to silty clay
8.80	28.9	8.4	0.177	2.12	0.0	clayey silt to silty clay
8.90	29.2	9.6	0.219	2.28	0.0	silty clay to clay
9.00	29.5	9.5	0.222	2.33	0.0	silty clay to clay
9.10	29.9	9.7	0.203	2.09	0.0	silty clay to clay
9.20	30.2	9.8	0.254	2.59	0.0	silty clay to clay
9.30	30.5	10.9	0.296	2.71	0.0	silty clay to clay
9.40	30.8	10.2	0.266	2.61	0.0	silty clay to clay

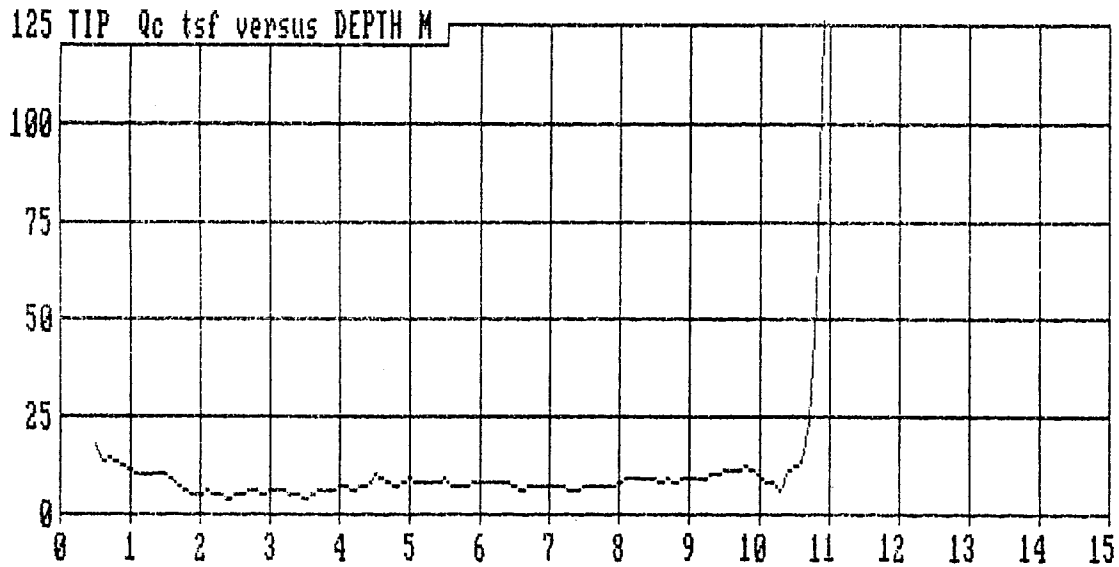
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.50	31.2	11.3	0.292	2.59	0.0	silty clay to clay
9.60	31.5	11.1	0.234	2.11	0.0	clayey silt to silty clay
9.70	31.8	11.6	0.067	0.58	0.0	sandy silt to clayey silt
9.80	32.2	12.5	0.066	0.53	0.0	sandy silt to clayey silt
9.90	32.5	11.1	0.142	1.28	0.0	clayey silt to silty clay
10.00	32.8	10.8	0.170	1.58	0.0	clayey silt to silty clay
10.10	33.1	8.8	0.116	1.33	0.0	clayey silt to silty clay
10.20	33.5	8.8	0.174	1.99	0.0	clayey silt to silty clay
10.30	33.8	5.5	0.103	1.60	0.0	silty clay to clay
10.40	34.1	11.2	0.308	2.75	0.0	silty clay to clay
10.50	34.4	12.2	0.485	3.98	0.0	clay
10.60	34.8	13.9	0.733	5.28	0.0	clay
10.70	35.1	23.7	0.983	4.15	0.0	clayey silt to silty clay
10.80	35.4	52.8	1.249	2.37	0.0	?
10.90	35.8	142.6	?	?	0.0	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 * sliding data average

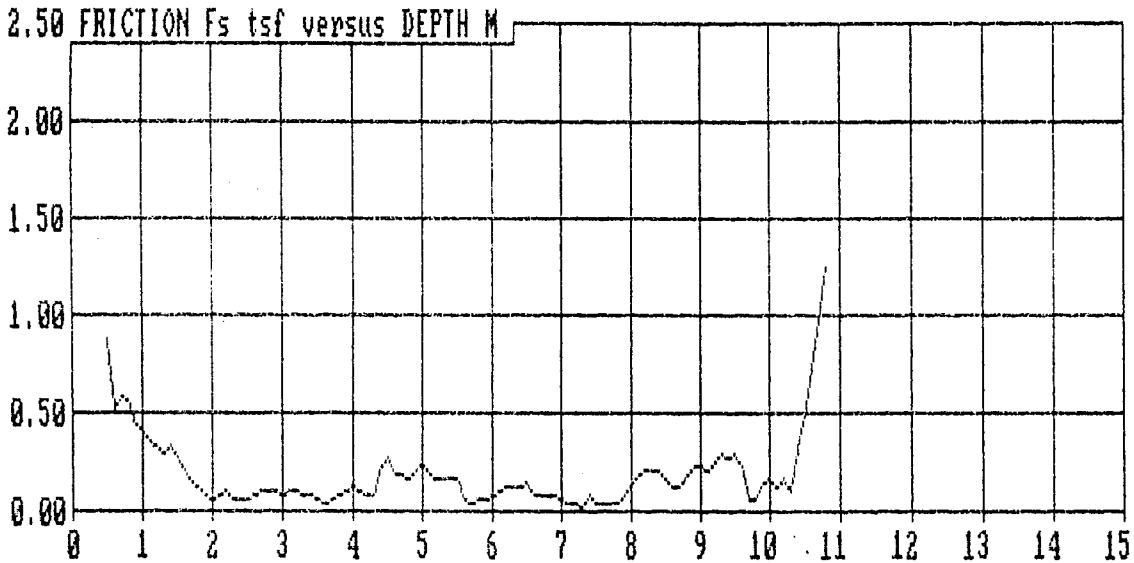
SOUNDING DATA IN FILE SND-94 06-27-94 21:24
OPERATOR : S.VAN LOCATION : P-9/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND-94 06-27-94 21:24
OPERATOR : S.VAN LOCATION : P-9/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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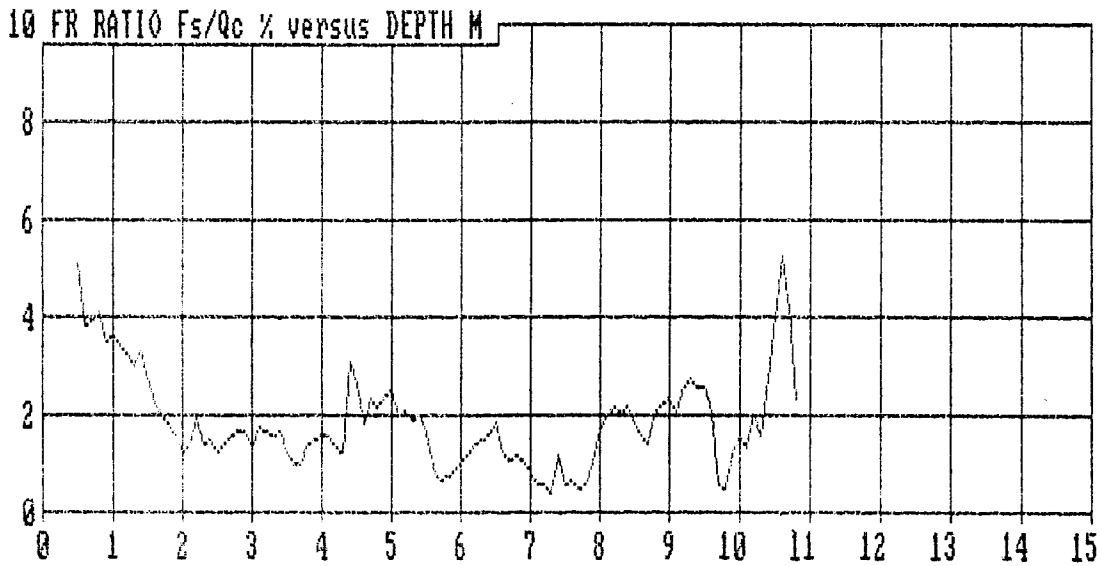
OPERATOR : S.VAN LOCATION : P-9/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



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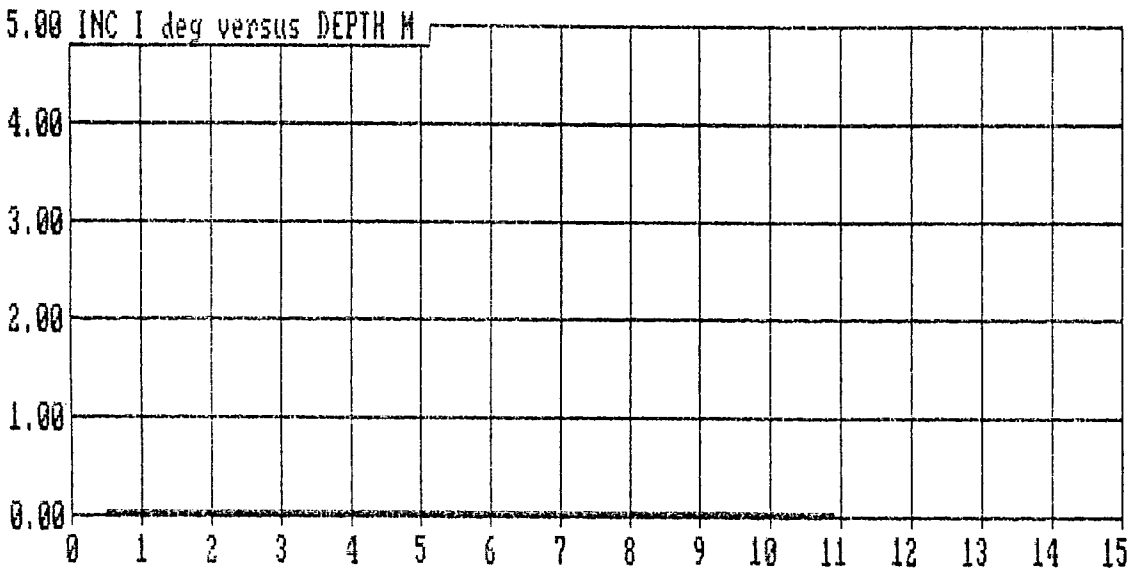
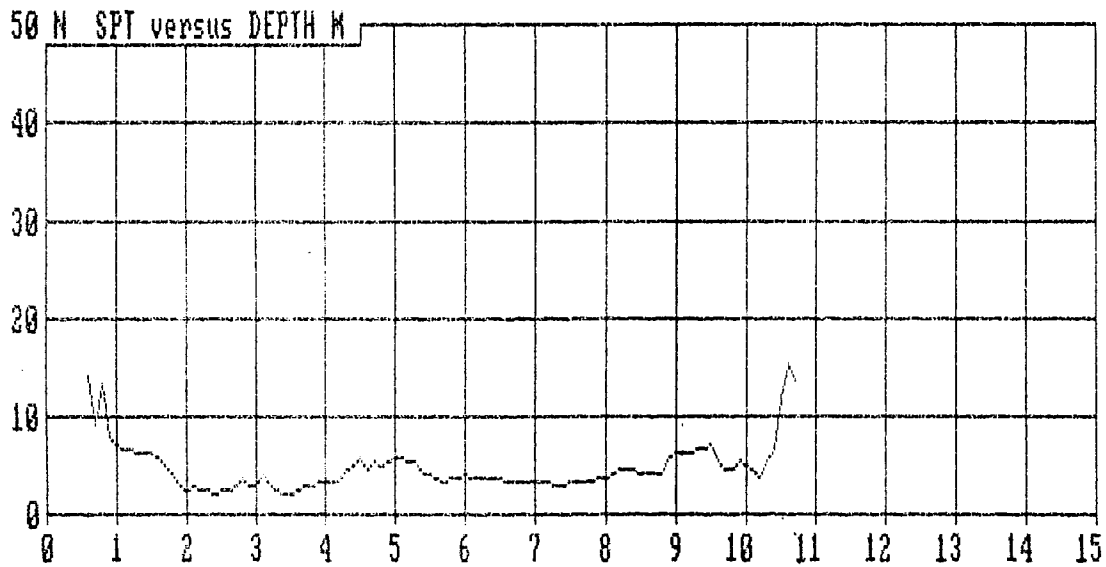
OPERATOR : S.VAN LOCATION : P-9/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND-94 06-27-94 21:24
OPERATOR : S.VAN LOCATION : P-9/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

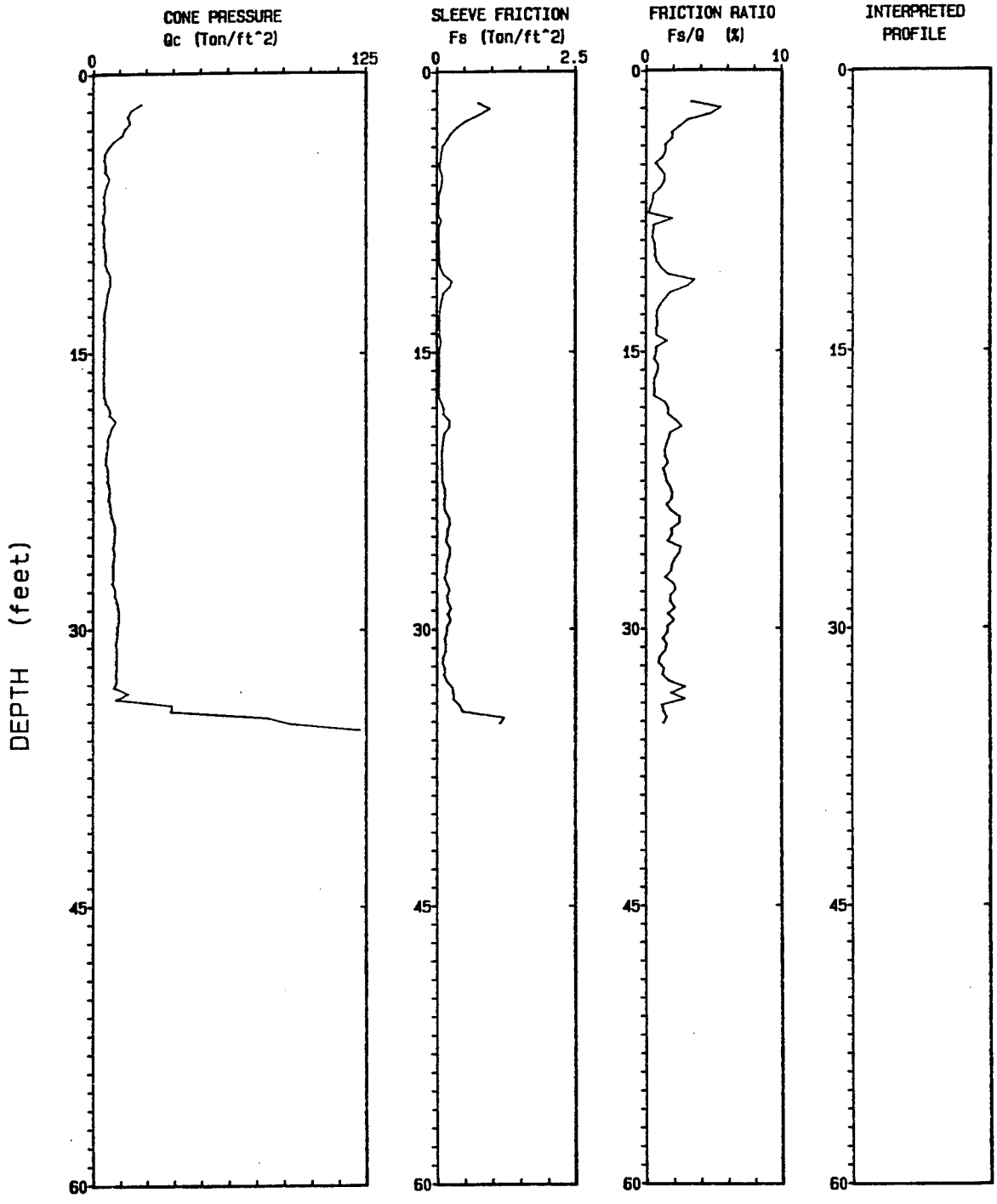


SCPT P-10

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND-95 Pg 1 / 1
Client : WES

CPT Date : 06-28-94 16:09
Location : P-108FC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 35.43 ft

SOUNDING DATA IN FILE SND-95 06-28-94 16:09

OPERATOR : S.VAN LOCATION : P-10BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.50	1.6	22.6	0.760	3.36	0.3	?
0.60	2.0	17.5	0.962	5.48	0.3	clay
0.70	2.3	16.0	0.755	4.71	0.1	clay
0.80	2.6	17.4	0.518	2.98	0.1	silty clay to clay
0.90	3.0	14.7	0.359	2.44	0.1	clayey silt to silty clay
1.00	3.3	13.4	0.245	1.83	0.1	clayey silt to silty clay
1.10	3.6	9.5	0.176	1.86	0.1	clayey silt to silty clay
1.20	3.9	7.0	0.095	1.36	0.1	clayey silt to silty clay
1.30	4.3	5.4	0.076	1.41	0.1	sensitive fine grained
1.40	4.6	5.1	0.060	1.18	0.1	sensitive fine grained
1.50	4.9	5.9	0.038	0.64	0.1	sensitive fine grained
1.60	5.2	5.6	0.060	1.06	0.1	sensitive fine grained
1.70	5.6	7.5	0.103	1.38	0.1	sensitive fine grained
1.80	5.9	6.2	0.080	1.28	0.1	sensitive fine grained
1.90	6.2	5.4	0.054	0.98	0.1	sensitive fine grained
2.00	6.6	4.8	0.023	0.47	0.1	sensitive fine grained
2.10	6.9	4.9	0.022	0.44	0.1	sensitive fine grained
2.20	7.2	5.5	0.015	0.28	0.1	sensitive fine grained
2.30	7.5	4.6	0.006	0.14	0.1	sensitive fine grained
2.40	7.9	4.2	0.081	1.94	0.1	sensitive fine grained
2.50	8.2	5.4	0.028	0.51	0.0	sensitive fine grained
2.60	8.5	4.7	0.023	0.48	0.0	sensitive fine grained
2.70	8.9	4.7	0.020	0.42	0.0	sensitive fine grained
2.80	9.2	4.8	0.030	0.63	0.0	sensitive fine grained
2.90	9.5	5.7	0.038	0.66	0.0	sensitive fine grained
3.00	9.8	5.8	0.039	0.67	0.0	sensitive fine grained
3.10	10.2	5.4	0.044	0.81	0.0	sensitive fine grained
3.20	10.5	6.5	0.074	1.13	0.0	sensitive fine grained
3.30	10.8	8.1	0.133	1.65	0.0	silty clay to clay
3.40	11.2	7.7	0.274	3.57	0.0	silty clay to clay
3.50	11.5	7.3	0.219	2.99	0.0	clay
3.60	11.8	6.3	0.109	1.73	0.0	silty clay to clay
3.70	12.1	6.1	0.084	1.37	0.0	sensitive fine grained
3.80	12.5	5.6	0.057	1.01	0.0	sensitive fine grained
3.90	12.8	5.2	0.040	0.77	0.0	sensitive fine grained
4.00	13.1	4.8	0.035	0.72	0.0	sensitive fine grained
4.10	13.5	5.0	0.043	0.85	0.0	sensitive fine grained
4.20	13.8	5.4	0.038	0.71	0.0	sensitive fine grained
4.30	14.1	5.3	0.040	0.75	0.0	sensitive fine grained
4.40	14.4	4.8	0.075	1.55	0.0	sensitive fine grained

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.50	14.8	5.2	0.037	0.71	0.0	sensitive fine grained
4.60	15.1	4.8	0.033	0.68	0.0	sensitive fine grained
4.70	15.4	5.1	0.030	0.59	0.0	sensitive fine grained
4.80	15.7	4.8	0.044	0.92	0.0	sensitive fine grained
4.90	16.1	4.9	0.040	0.81	0.0	sensitive fine grained
5.00	16.4	4.7	0.028	0.61	0.0	sensitive fine grained
5.10	16.7	4.8	0.025	0.53	0.0	sensitive fine grained
5.20	17.1	5.0	0.031	0.63	0.0	sensitive fine grained
5.30	17.4	5.2	0.031	0.59	0.0	sensitive fine grained
5.40	17.7	6.0	0.084	1.41	0.0	sensitive fine grained
5.50	18.0	7.7	0.128	1.65	0.0	clayey silt to silty clay
5.60	18.4	7.6	0.125	1.60	0.0	clayey silt to silty clay
5.70	18.7	10.5	0.232	2.21	0.0	silty clay to clay
5.80	19.0	8.5	0.224	2.62	0.0	silty clay to clay
5.90	19.4	7.6	0.133	1.76	0.0	silty clay to clay
6.00	19.7	6.6	0.107	1.62	0.0	silty clay to clay
6.10	20.0	6.8	0.098	1.46	0.0	sensitive fine grained
6.20	20.3	6.2	0.083	1.34	0.0	sensitive fine grained
6.30	20.7	5.7	0.081	1.42	0.0	sensitive fine grained
6.40	21.0	5.8	0.095	1.63	0.0	sensitive fine grained
6.50	21.3	7.0	0.087	1.24	0.0	sensitive fine grained
6.60	21.7	6.9	0.099	1.44	0.0	sensitive fine grained
6.70	22.0	6.7	0.101	1.50	0.0	clayey silt to silty clay
6.80	22.3	7.5	0.134	1.78	0.0	silty clay to clay
6.90	22.6	7.8	0.149	1.93	0.0	silty clay to clay
7.00	23.0	7.0	0.130	1.86	0.0	silty clay to clay
7.10	23.3	8.0	0.119	1.49	0.0	clayey silt to silty clay
7.20	23.6	8.2	0.155	1.89	0.0	silty clay to clay
7.30	23.9	8.9	0.221	2.49	0.0	silty clay to clay
7.40	24.3	9.8	0.240	2.44	0.0	silty clay to clay
7.50	24.6	10.3	0.189	1.83	0.0	clayey silt to silty clay
7.60	24.9	9.8	0.183	1.86	0.0	clayey silt to silty clay
7.70	25.3	9.7	0.153	1.58	0.0	clayey silt to silty clay
7.80	25.6	9.1	0.233	2.57	0.0	silty clay to clay
7.90	25.9	9.9	0.239	2.40	0.0	silty clay to clay
8.00	26.2	9.5	0.198	2.08	0.0	clayey silt to silty clay
8.10	26.6	9.1	0.169	1.87	0.0	clayey silt to silty clay
8.20	26.9	9.1	0.166	1.81	0.0	clayey silt to silty clay
8.30	27.2	9.2	0.127	1.38	0.0	clayey silt to silty clay
8.40	27.6	8.9	0.180	2.02	0.0	clayey silt to silty clay
8.50	27.9	10.5	0.230	2.20	0.0	clayey silt to silty clay
8.60	28.2	10.0	0.174	1.74	0.0	clayey silt to silty clay
8.70	28.5	11.3	0.201	1.78	0.0	clayey silt to silty clay
8.80	28.9	11.8	0.253	2.14	0.0	clayey silt to silty clay
8.90	29.2	12.2	0.192	1.58	0.0	clayey silt to silty clay
9.00	29.5	12.1	0.251	2.08	0.0	clayey silt to silty clay
9.10	29.9	11.2	0.174	1.55	0.0	clayey silt to silty clay
9.20	30.2	11.1	0.171	1.54	0.0	clayey silt to silty clay
9.30	30.5	10.8	0.129	1.20	0.0	clayey silt to silty clay
9.40	30.8	10.4	0.159	1.53	0.0	clayey silt to silty clay

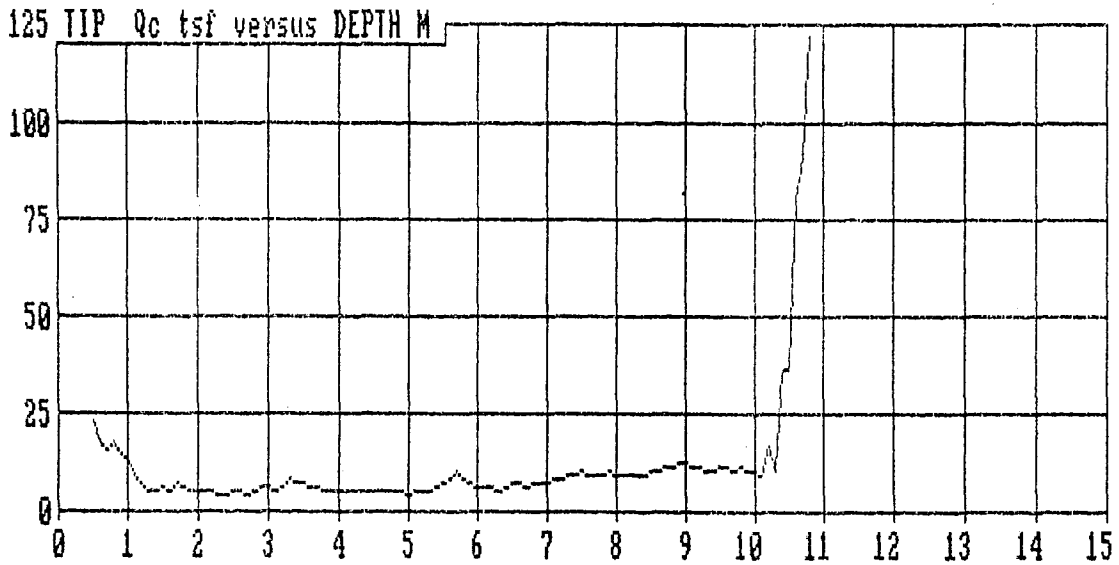
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.50	31.2	11.1	0.153	1.37	0.1	clayey silt to silty clay
9.60	31.5	10.9	0.106	0.97	0.1	clayey silt to silty clay
9.70	31.8	10.6	0.092	0.87	0.1	clayey silt to silty clay
9.80	32.2	11.0	0.144	1.32	0.1	clayey silt to silty clay
9.90	32.5	10.5	0.123	1.17	0.1	clayey silt to silty clay
10.00	32.8	10.9	0.182	1.67	0.1	clayey silt to silty clay
10.10	33.1	9.6	0.278	2.88	0.1	clayey silt to silty clay
10.20	33.5	16.4	0.301	1.83	0.0	clayey silt to silty clay
10.30	33.8	10.7	0.305	2.86	0.0	sandy silt to clayey silt
10.40	34.1	36.8	0.415	1.13	0.0	sandy silt to clayey silt
10.50	34.4	36.6	0.474	1.30	0.0	silty sand to sandy silt
10.60	34.8	80.1	1.227	1.53	0.0	silty sand to sandy silt
10.70	35.1	91.4	1.139	1.25	0.1	?
10.80	35.4	122.2	?	?	0.1	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

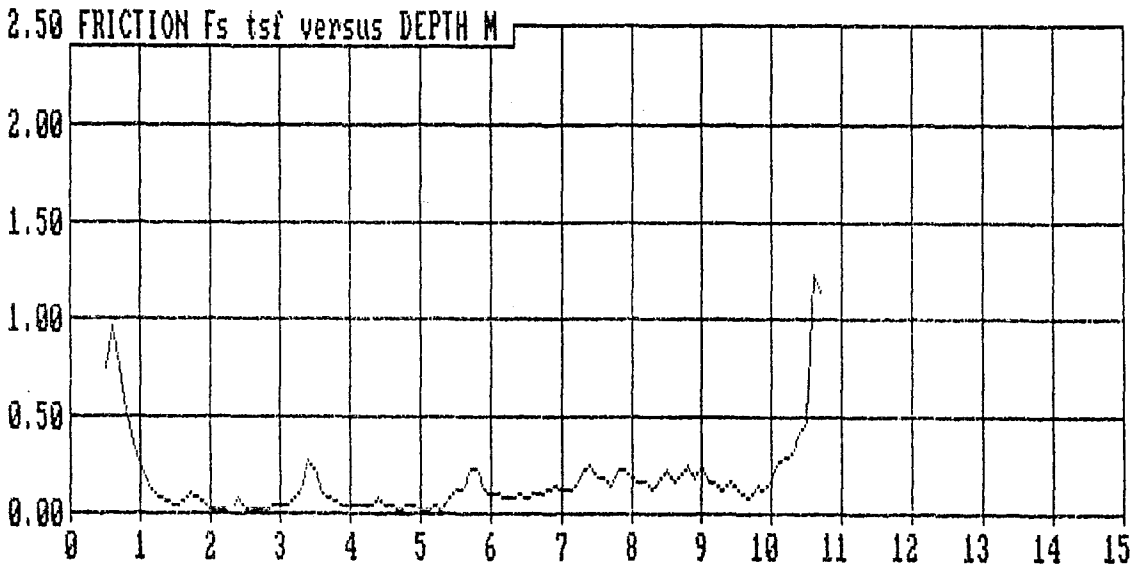
SOUNDING DATA IN FILE SND-95 06-28-94 16:09
OPERATOR : S.VAN LOCATION : P-10BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



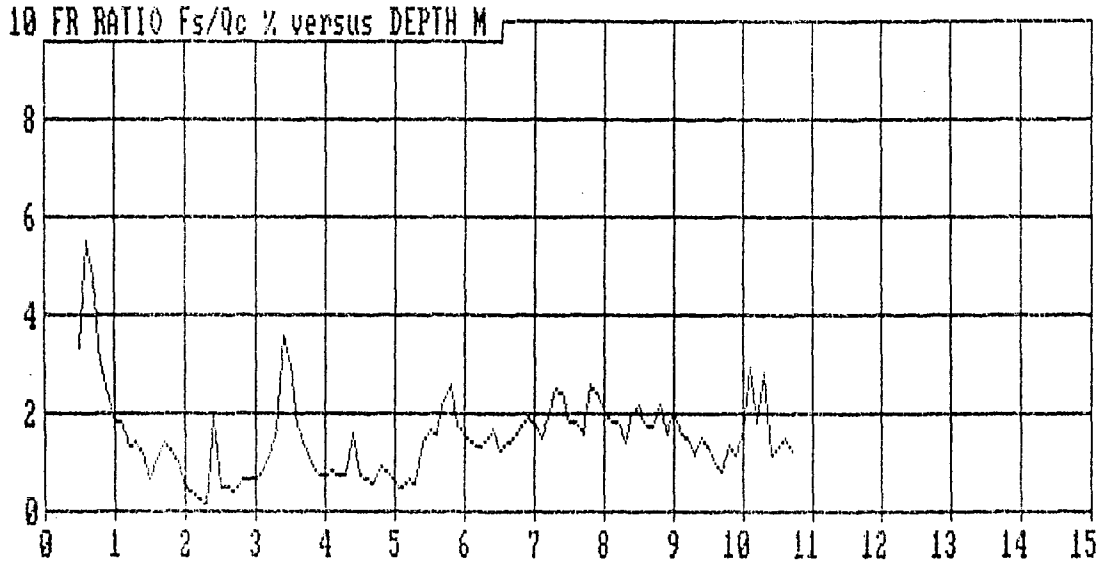
SOUNDING DATA IN FILE SND-95 06-28-94 16:09
OPERATOR : S.VAN LOCATION : P-10BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



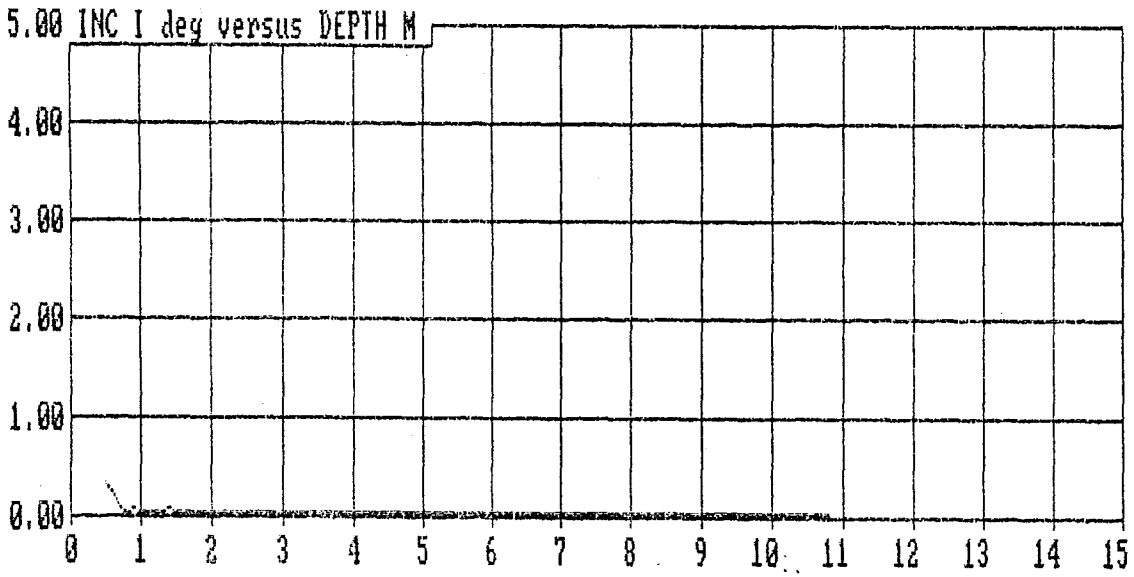
SOUNDING DATA IN FILE SND-95 06-28-94 16:09
OPERATOR : S.VAN LOCATION : P-10BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



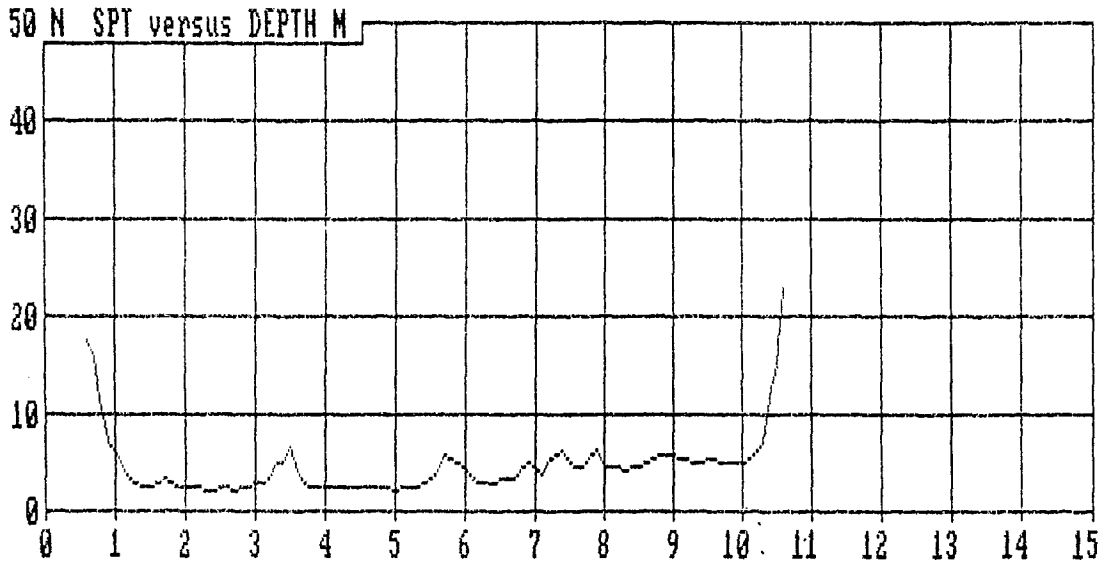
SOUNDING DATA IN FILE SND-95 06-28-94 16:09
OPERATOR : S.VAN LOCATION : P-10BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND-95 06-28-94 16:09
OPERATOR : S.VAN LOCATION : P-10BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

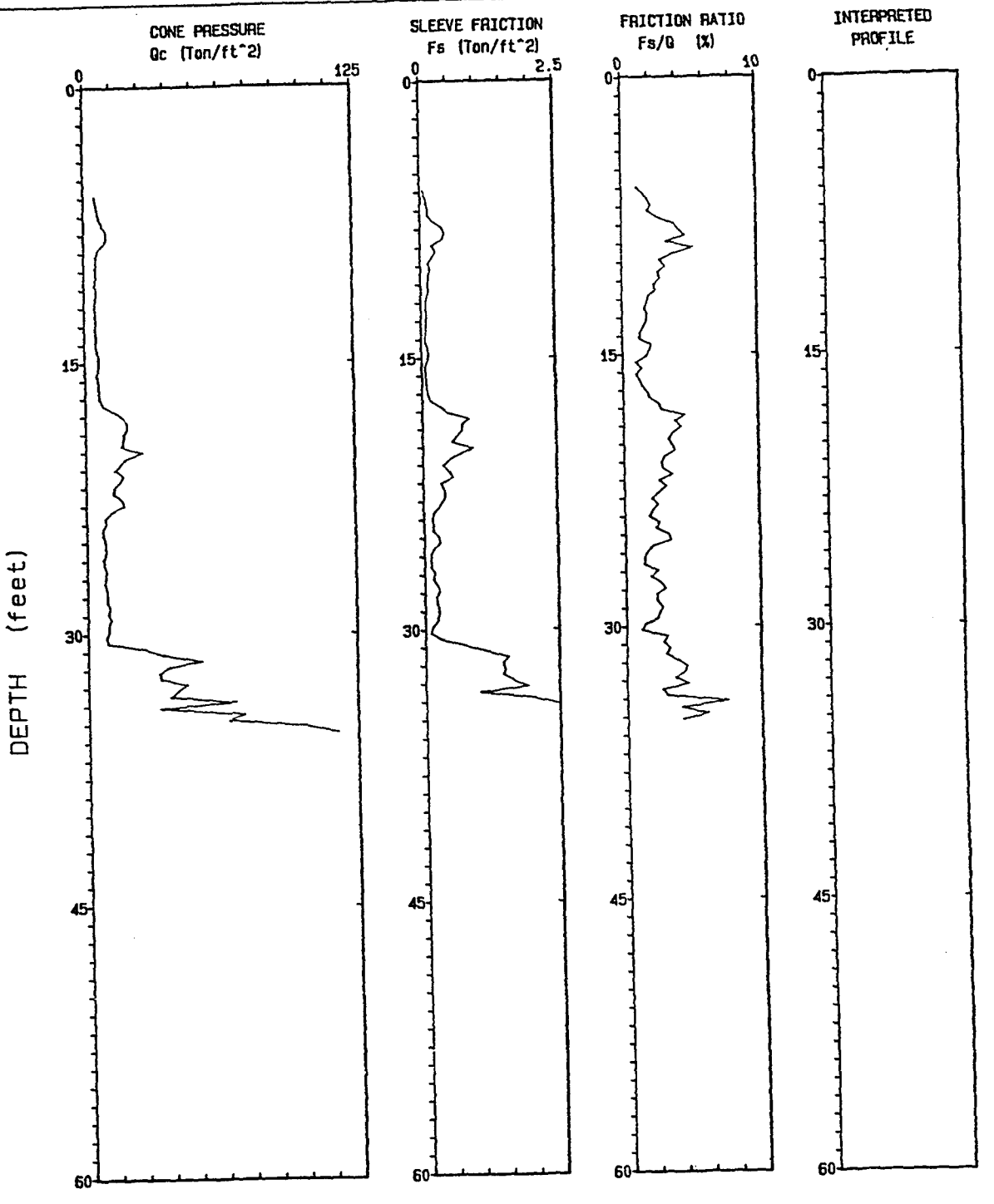


SCPT P-11

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND-97 Pg 1 / 1
Client : WES

CPT Date : 06-28-94 19:36
Location : P-11/BFC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 35.43 ft

SOUNDING DATA IN FILE SND-97 06-28-94 19:36

OPERATOR : S.VAN LOCATION : P-11/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
1.80	5.9	5.0	0.057	1.14	0.1	?
1.90	6.2	5.5	0.088	1.61	0.1	sensitive fine grained
2.00	6.6	6.1	0.117	1.92	0.1	silty clay to clay
2.10	6.9	6.8	0.148	2.18	0.0	silty clay to clay
2.20	7.2	7.5	0.143	1.92	0.0	silty clay to clay
2.30	7.5	8.8	0.241	2.74	0.1	silty clay to clay
2.40	7.9	10.7	0.415	3.89	0.0	clay
2.50	8.2	10.7	0.460	4.27	0.0	clay
2.60	8.5	8.6	0.409	4.74	0.0	clay
2.70	8.9	6.1	0.204	3.34	0.0	clay
2.80	9.2	5.4	0.290	5.34	0.0	clay
2.90	9.5	5.6	0.215	3.85	0.0	clay
3.00	9.8	5.0	0.139	2.80	0.0	clay
3.10	10.2	5.4	0.175	3.24	0.0	clay
3.20	10.5	5.4	0.146	2.69	0.0	clay
3.30	10.8	4.7	0.134	2.84	0.0	clay
3.40	11.2	5.6	0.133	2.39	0.0	clay
3.50	11.5	4.8	0.120	2.47	0.0	clay
3.60	11.8	4.9	0.095	1.95	0.0	silty clay to clay
3.70	12.1	4.7	0.086	1.83	0.0	silty clay to clay
3.80	12.5	5.0	0.083	1.66	0.0	silty clay to clay
3.90	12.8	5.2	0.098	1.87	0.0	silty clay to clay
4.00	13.1	5.2	0.094	1.80	0.0	silty clay to clay
4.10	13.5	5.3	0.082	1.55	0.0	sensitive fine grained
4.20	13.8	5.4	0.071	1.33	0.0	sensitive fine grained
4.30	14.1	5.4	0.068	1.24	0.0	sensitive fine grained
4.40	14.4	5.8	0.126	2.16	0.0	silty clay to clay
4.50	14.8	6.6	0.131	1.98	0.1	silty clay to clay
4.60	15.1	6.3	0.105	1.67	0.1	silty clay to clay
4.70	15.4	5.9	0.058	0.97	0.1	sensitive fine grained
4.80	15.7	5.1	0.075	1.45	0.1	sensitive fine grained
4.90	16.1	5.9	0.057	0.95	0.1	sensitive fine grained
5.00	16.4	6.0	0.072	1.20	0.1	sensitive fine grained
5.10	16.7	6.5	0.095	1.46	0.1	sensitive fine grained
5.20	17.1	6.7	0.121	1.80	0.0	silty clay to clay
5.30	17.4	8.2	0.163	1.98	0.1	silty clay to clay
5.40	17.7	13.1	0.344	2.63	0.1	clayey silt to silty clay
5.50	18.0	17.2	0.495	2.87	0.1	silty clay to clay
5.60	18.4	19.3	0.884	4.59	0.0	silty clay to clay
5.70	18.7	19.1	0.731	3.84	0.0	silty clay to clay

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

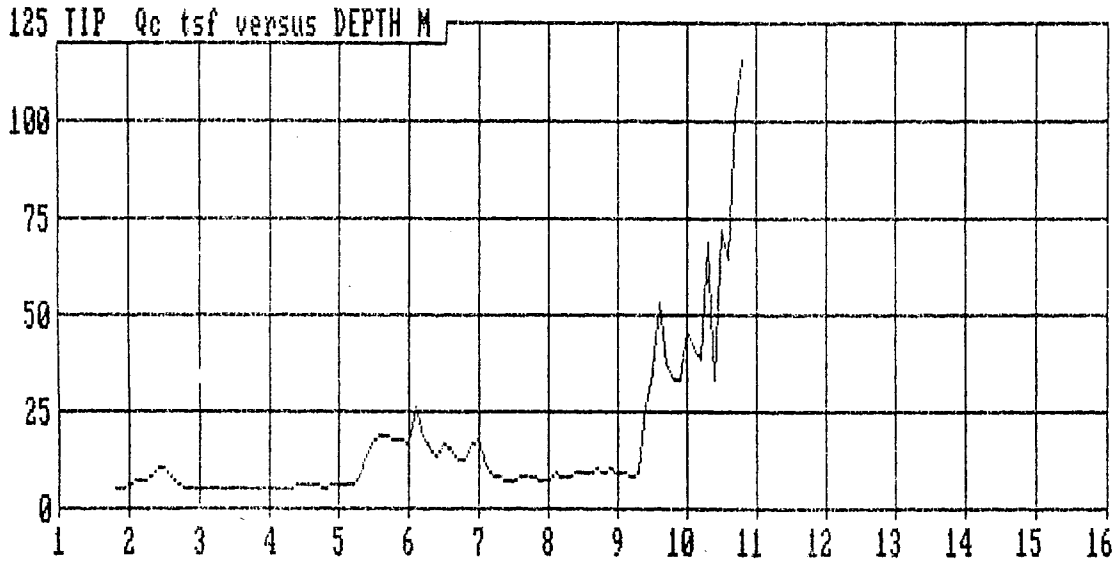
DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
5.80	19.0	17.2	0.733	4.26	0.0	silty clay to clay
5.90	19.4	17.6	0.639	3.64	0.0	silty clay to clay
6.00	19.7	16.7	0.554	3.32	0.0	silty clay to clay
6.10	20.0	26.1	0.944	3.62	0.0	silty clay to clay
6.20	20.3	18.3	0.690	3.77	0.0	silty clay to clay
6.30	20.7	16.1	0.483	3.00	0.0	silty clay to clay
6.40	21.0	13.5	0.377	2.79	0.0	clayey silt to silty clay
6.50	21.3	17.1	0.495	2.89	0.1	clayey silt to silty clay
6.60	21.7	15.4	0.557	3.61	0.1	silty clay to clay
6.70	22.0	12.9	0.336	2.60	0.1	silty clay to clay
6.80	22.3	12.4	0.392	3.15	0.1	clayey silt to silty clay
6.90	22.6	16.4	0.410	2.50	0.1	clayey silt to silty clay
7.00	23.0	17.5	0.356	2.04	0.1	clayey silt to silty clay
7.10	23.3	11.5	0.289	2.51	0.1	clayey silt to silty clay
7.20	23.6	8.7	0.180	2.07	0.1	clayey silt to silty clay
7.30	23.9	8.5	0.152	1.78	0.1	silty clay to clay
7.40	24.3	7.0	0.183	2.61	0.1	silty clay to clay
7.50	24.6	7.5	0.174	2.31	0.1	silty clay to clay
7.60	24.9	8.4	0.274	3.26	0.1	clay
7.70	25.3	8.6	0.291	3.36	0.1	silty clay to clay
7.80	25.6	8.7	0.171	1.97	0.1	silty clay to clay
7.90	25.9	7.3	0.116	1.59	0.1	clayey silt to silty clay
8.00	26.2	7.7	0.105	1.36	0.1	clayey silt to silty clay
8.10	26.6	8.9	0.123	1.37	0.1	clayey silt to silty clay
8.20	26.9	8.4	0.204	2.44	0.1	silty clay to clay
8.30	27.2	7.8	0.147	1.88	0.1	silty clay to clay
8.40	27.6	8.9	0.229	2.57	0.1	silty clay to clay
8.50	27.9	9.2	0.270	2.94	0.1	silty clay to clay
8.60	28.2	9.3	0.212	2.29	0.1	silty clay to clay
8.70	28.5	10.3	0.238	2.30	0.1	silty clay to clay
8.80	28.9	9.3	0.254	2.72	0.1	silty clay to clay
8.90	29.2	10.6	0.266	2.51	0.1	silty clay to clay
9.00	29.5	9.5	0.219	2.31	0.1	clayey silt to silty clay
9.10	29.9	9.5	0.129	1.35	0.1	clayey silt to silty clay
9.20	30.2	8.3	0.092	1.11	0.1	clayey silt to silty clay
9.30	30.5	9.4	0.290	3.09	0.1	clayey silt to silty clay
9.40	30.8	26.6	0.742	2.79	0.1	clayey silt to silty clay
9.50	31.2	35.3	1.139	3.23	0.1	clayey silt to silty clay
9.60	31.5	52.8	1.554	2.94	0.1	clayey silt to silty clay
9.70	31.8	37.7	1.452	3.85	0.1	clayey silt to silty clay
9.80	32.2	32.8	1.494	4.55	0.1	silty clay to clay
9.90	32.5	33.7	1.448	4.29	0.1	silty clay to clay
10.00	32.8	45.8	1.672	3.65	0.1	clayey silt to silty clay
10.10	33.1	41.3	1.922	4.65	0.1	clayey silt to silty clay
10.20	33.5	38.1	1.022	2.68	0.1	clayey silt to silty clay
10.30	33.8	68.4	2.055	3.00	0.1	clayey silt to silty clay
10.40	34.1	33.2	2.499	7.52	0.3	silty clay to clay
10.50	34.4	72.0	2.972	4.13	0.2	silty clay to clay
10.60	34.8	65.0	3.935	6.05	0.2	very stiff fine grained (*)
10.70	35.1	101.8	4.225	4.15	0.2	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
10.80	35.4	115.6	?	?	0.2	?

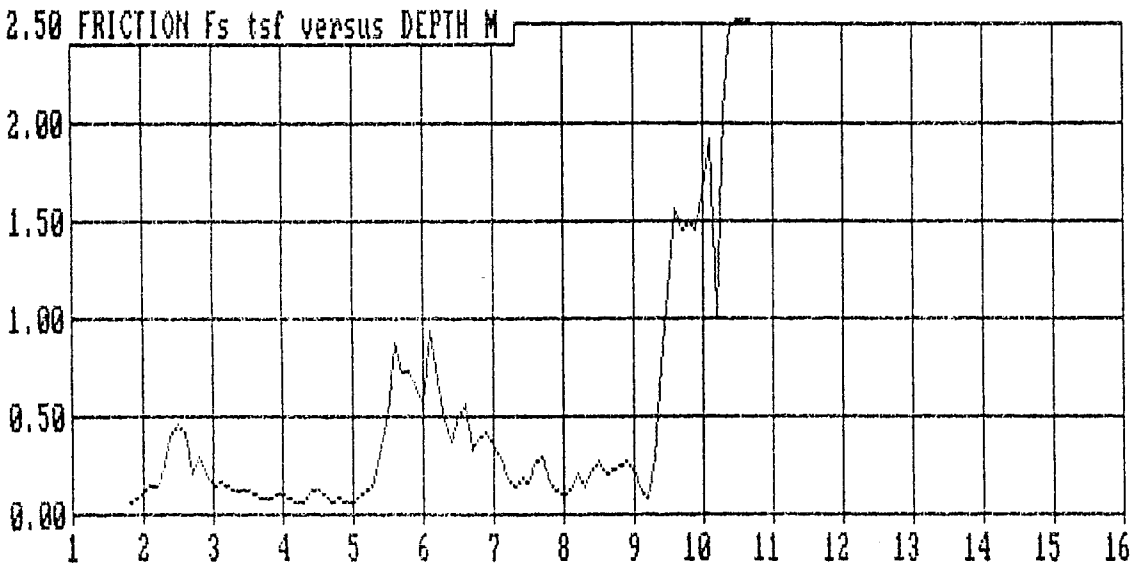
SOUNDING DATA IN FILE SND-97 06-28-94 19:36
OPERATOR : S.VAN LOCATION : P-11/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5962

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



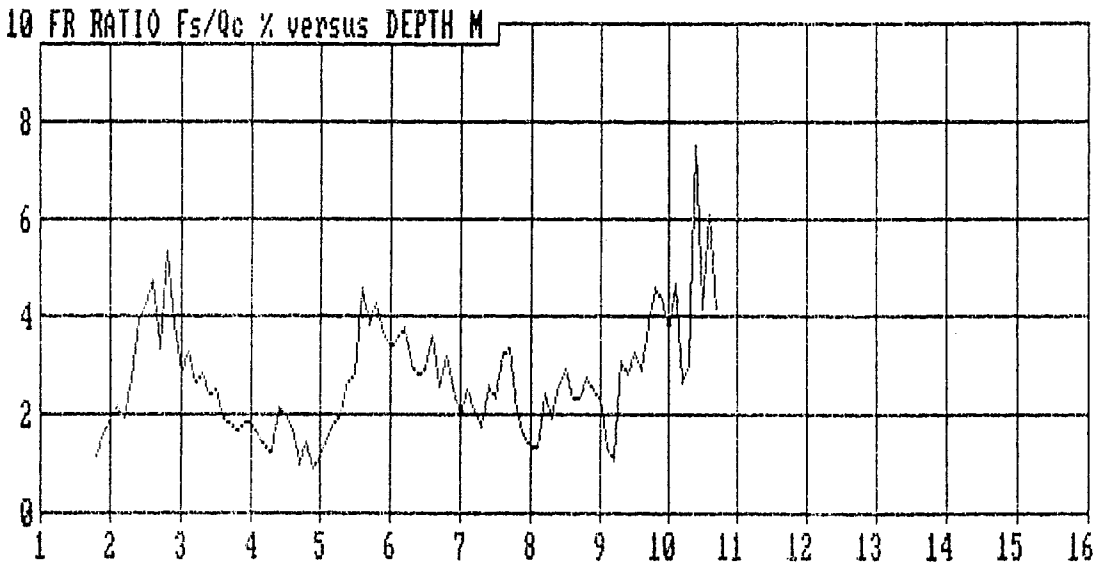
SOUNDING DATA IN FILE SND-97 06-28-94 19:36
OPERATOR : S.VAN LOCATION : P-11/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



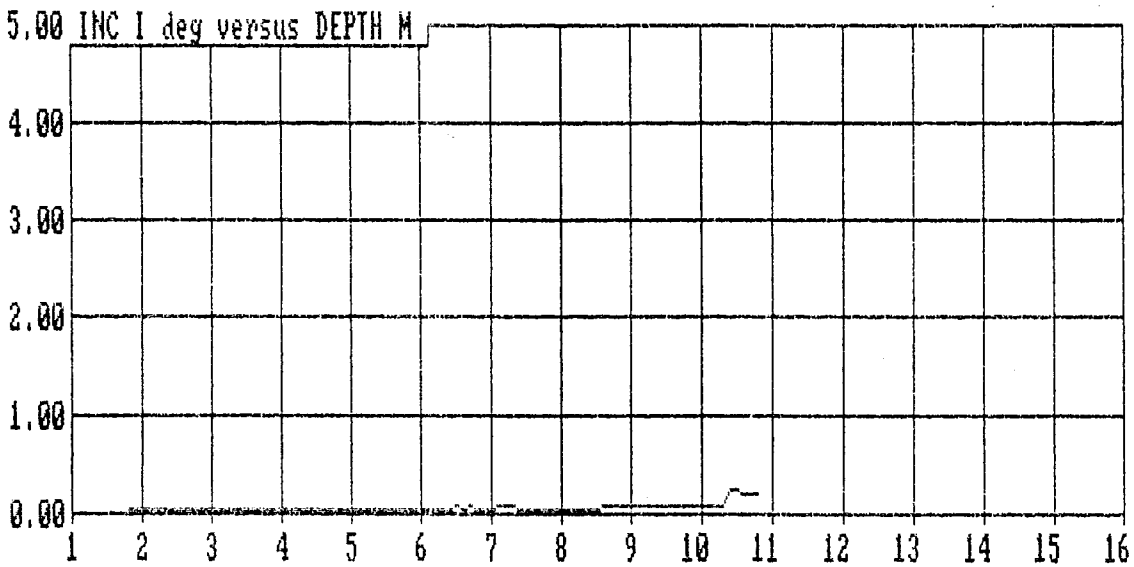
SOUNDING DATA IN FILE SND-97 06-28-94 19:36
OPERATOR : S.VAN LOCATION : P-11/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



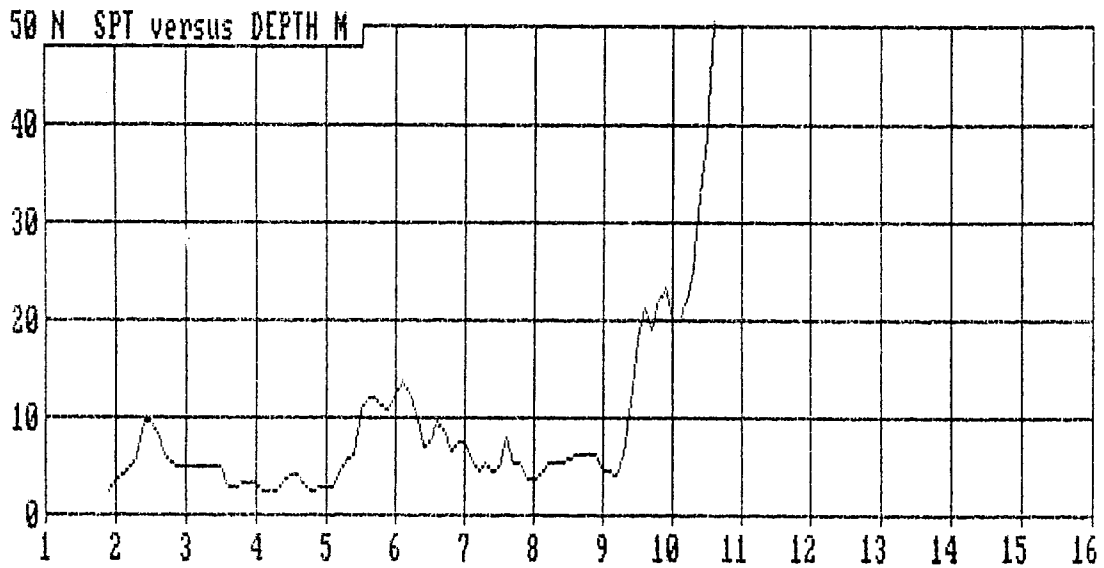
SOUNDING DATA IN FILE SND-97 06-28-94 19:36
OPERATOR : S.VAN LOCATION : P-11/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5862

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND-97 06-28-94 19:36
OPERATOR : S.VAN LOCATION : P-11/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

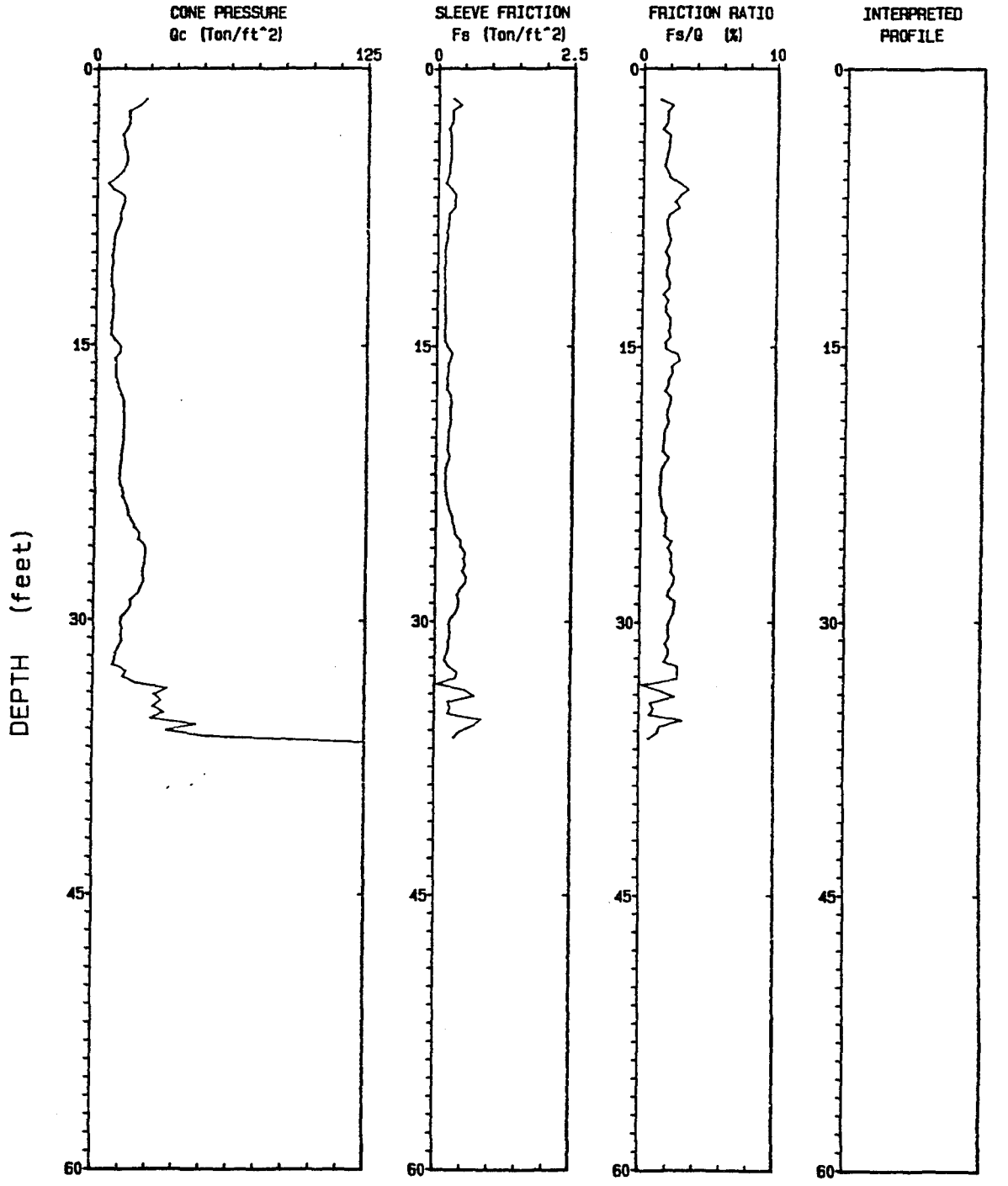


SCPT P-12

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND109 Pg 1 / 1
Client : WES

CPT Date : 06-30-94 20:07
Location : P-12/BFC-KC-MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 36.75 ft

SOUNDING DATA IN FILE SND109 06-30-94 20:07

OPERATOR : S.VAN LOCATION : P-12/BFC-KC-MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.50	1.6	22.8	0.276	1.23	0.0	?
0.60	2.0	19.6	0.421	2.15	0.0	sandy silt to clayey silt
0.70	2.3	14.8	0.253	1.73	0.1	clayey silt to silty clay
0.80	2.6	14.5	0.250	1.73	0.1	clayey silt to silty clay
0.90	3.0	14.6	0.242	1.66	0.1	clayey silt to silty clay
1.00	3.3	13.4	0.180	1.34	0.1	clayey silt to silty clay
1.10	3.6	11.6	0.230	1.98	0.1	clayey silt to silty clay
1.20	3.9	12.5	0.234	1.87	0.0	clayey silt to silty clay
1.30	4.3	12.7	0.235	1.85	0.0	clayey silt to silty clay
1.40	4.6	13.6	0.236	1.73	0.1	clayey silt to silty clay
1.50	4.9	13.9	0.226	1.62	0.1	clayey silt to silty clay
1.60	5.2	13.2	0.203	1.54	0.1	clayey silt to silty clay
1.70	5.6	11.8	0.219	1.85	0.0	clayey silt to silty clay
1.80	5.9	9.1	0.181	2.00	0.1	silty clay to clay
1.90	6.2	5.1	0.138	2.71	0.1	silty clay to clay
2.00	6.6	7.6	0.255	3.33	0.1	silty clay to clay
2.10	6.9	12.2	0.330	2.70	0.1	silty clay to clay
2.20	7.2	13.0	0.310	2.38	0.1	clayey silt to silty clay
2.30	7.5	11.7	0.317	2.71	0.1	clayey silt to silty clay
2.40	7.9	10.7	0.204	1.91	0.1	clayey silt to silty clay
2.50	8.2	11.2	0.195	1.74	0.1	clayey silt to silty clay
2.60	8.5	10.0	0.182	1.82	0.1	clayey silt to silty clay
2.70	8.9	8.5	0.169	1.99	0.1	clayey silt to silty clay
2.80	9.2	7.9	0.165	2.07	0.1	silty clay to clay
2.90	9.5	7.5	0.141	1.87	0.1	silty clay to clay
3.00	9.8	7.3	0.120	1.65	0.1	silty clay to clay
3.10	10.2	6.9	0.133	1.93	0.1	silty clay to clay
3.20	10.5	7.5	0.140	1.88	0.1	silty clay to clay
3.30	10.8	6.9	0.122	1.76	0.1	silty clay to clay
3.40	11.2	6.7	0.120	1.80	0.1	silty clay to clay
3.50	11.5	6.6	0.132	2.01	0.1	silty clay to clay
3.60	11.8	7.1	0.136	1.92	0.1	silty clay to clay
3.70	12.1	7.9	0.117	1.49	0.1	clayey silt to silty clay
3.80	12.5	7.8	0.151	1.93	0.1	clayey silt to silty clay
3.90	12.8	7.8	0.133	1.72	0.1	clayey silt to silty clay
4.00	13.1	7.6	0.134	1.77	0.1	silty clay to clay
4.10	13.5	7.6	0.161	2.11	0.1	silty clay to clay
4.20	13.8	6.8	0.140	2.05	0.1	silty clay to clay
4.30	14.1	6.8	0.133	1.95	0.1	silty clay to clay
4.40	14.4	7.2	0.153	2.13	0.1	silty clay to clay

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.50	14.8	9.1	0.155	1.70	0.2	clayey silt to silty clay
4.60	15.1	11.6	0.210	1.81	0.2	clayey silt to silty clay
4.70	15.4	11.0	0.291	2.65	0.2	silty clay to clay
4.80	15.7	8.7	0.243	2.80	0.2	silty clay to clay
4.90	16.1	9.3	0.204	2.20	0.2	silty clay to clay
5.00	16.4	9.1	0.207	2.27	0.2	silty clay to clay
5.10	16.7	9.3	0.183	1.96	0.2	clayey silt to silty clay
5.20	17.1	10.1	0.155	1.52	0.2	clayey silt to silty clay
5.30	17.4	10.7	0.182	1.70	0.2	clayey silt to silty clay
5.40	17.7	11.8	0.261	2.21	0.4	clayey silt to silty clay
5.50	18.0	13.3	0.280	2.10	0.3	clayey silt to silty clay
5.60	18.4	13.2	0.255	1.93	0.3	clayey silt to silty clay
5.70	18.7	13.2	0.244	1.85	0.3	clayey silt to silty clay
5.80	19.0	13.3	0.268	2.02	0.5	clayey silt to silty clay
5.90	19.4	13.2	0.240	1.82	0.4	clayey silt to silty clay
6.00	19.7	13.0	0.219	1.69	0.4	clayey silt to silty clay
6.10	20.0	13.3	0.223	1.68	0.4	clayey silt to silty clay
6.20	20.3	12.9	0.210	1.63	0.5	clayey silt to silty clay
6.30	20.7	12.4	0.197	1.58	0.5	clayey silt to silty clay
6.40	21.0	12.0	0.247	2.05	0.5	clayey silt to silty clay
6.50	21.3	11.9	0.209	1.75	0.6	clayey silt to silty clay
6.60	21.7	11.6	0.174	1.50	0.6	clayey silt to silty clay
6.70	22.0	11.4	0.165	1.45	0.6	clayey silt to silty clay
6.80	22.3	11.2	0.167	1.49	0.6	clayey silt to silty clay
6.90	22.6	11.9	0.165	1.38	0.9	clayey silt to silty clay
7.00	23.0	12.7	0.175	1.38	0.9	clayey silt to silty clay
7.10	23.3	13.1	0.200	1.53	0.9	clayey silt to silty clay
7.20	23.6	14.4	0.219	1.53	0.9	clayey silt to silty clay
7.30	23.9	15.4	0.252	1.64	0.9	clayey silt to silty clay
7.40	24.3	15.8	0.303	1.92	0.9	clayey silt to silty clay
7.50	24.6	17.4	0.311	1.79	1.0	clayey silt to silty clay
7.60	24.9	18.6	0.349	1.88	1.0	sandy silt to clayey silt
7.70	25.3	21.0	0.371	1.76	1.2	sandy silt to clayey silt
7.80	25.6	20.4	0.472	2.32	1.2	sandy silt to clayey silt
7.90	25.9	23.4	0.467	2.00	1.4	sandy silt to clayey silt
8.00	26.2	23.9	0.551	2.31	1.4	sandy silt to clayey silt
8.10	26.6	23.4	0.523	2.23	1.4	sandy silt to clayey silt
8.20	26.9	23.3	0.558	2.40	1.4	clayey silt to silty clay
8.30	27.2	22.4	0.497	2.22	1.7	clayey silt to silty clay
8.40	27.6	22.4	0.572	2.56	1.7	clayey silt to silty clay
8.50	27.9	23.0	0.552	2.40	2.0	clayey silt to silty clay
8.60	28.2	21.2	0.448	2.11	2.0	clayey silt to silty clay
8.70	28.5	20.2	0.412	2.04	2.0	clayey silt to silty clay
8.80	28.9	17.0	0.446	2.62	2.2	clayey silt to silty clay
8.90	29.2	17.9	0.424	2.43	2.2	clayey silt to silty clay
9.00	29.5	15.3	0.372	2.44	2.2	clayey silt to silty clay
9.10	29.9	12.8	0.280	2.19	2.2	clayey silt to silty clay
9.20	30.2	12.2	0.246	2.02	2.7	clayey silt to silty clay
9.30	30.5	13.0	0.274	2.12	2.7	clayey silt to silty clay
9.40	30.8	12.4	0.263	2.12	2.7	clayey silt to silty clay

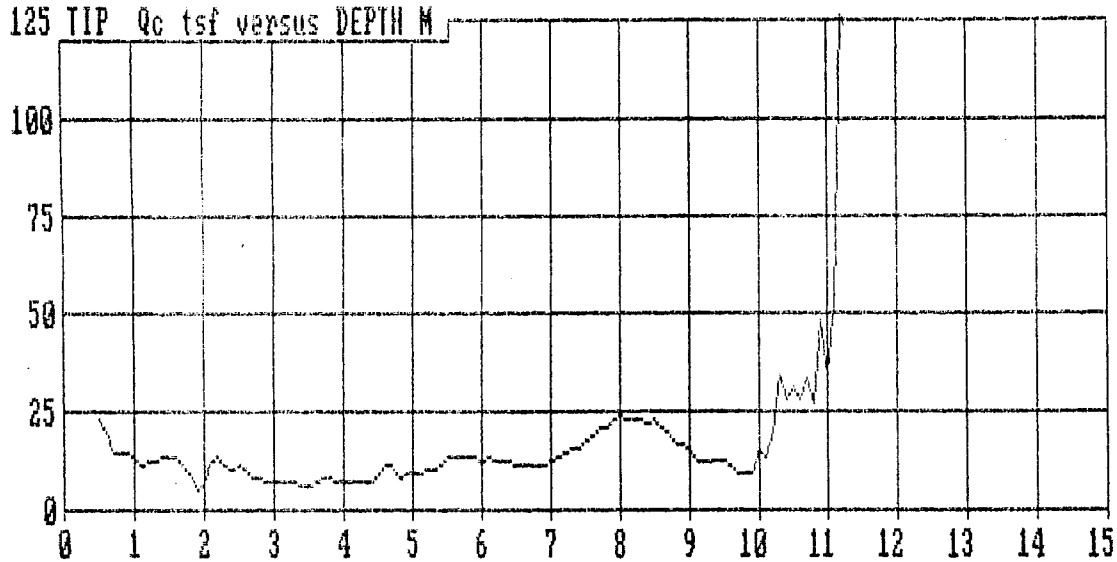
Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.50	31.2	12.9	0.236	1.82	2.8	clayey silt to silty clay
9.60	31.5	11.3	0.238	2.11	2.9	clayey silt to silty clay
9.70	31.8	9.8	0.200	2.05	3.0	clayey silt to silty clay
9.80	32.2	9.8	0.175	1.79	3.0	clayey silt to silty clay
9.90	32.5	8.9	0.253	2.84	3.1	silty clay to clay
10.00	32.8	15.1	0.417	2.76	3.1	clayey silt to silty clay
10.10	33.1	13.6	0.379	2.75	3.1	clayey silt to silty clay
10.20	33.5	19.5	0.035	0.18	3.1	sandy silt to clayey silt
10.30	33.8	34.8	0.571	1.64	3.2	sandy silt to clayey silt
10.40	34.1	28.6	0.746	2.61	3.3	sandy silt to clayey silt
10.50	34.4	31.5	0.249	0.79	3.4	sandy silt to clayey silt
10.60	34.8	28.0	0.294	1.05	3.6	silty sand to sandy silt
10.70	35.1	33.1	0.243	0.73	3.9	sandy silt to clayey silt
10.80	35.4	26.9	0.871	3.23	3.8	sandy silt to clayey silt
10.90	35.8	48.0	0.717	1.49	4.0	sandy silt to clayey silt
11.00	36.1	34.7	0.460	1.32	3.9	silty sand to sandy silt
11.10	36.4	52.7	0.359	0.68	4.2	?
11.20	36.7	139.3	?	?	4.2	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 * sliding data average

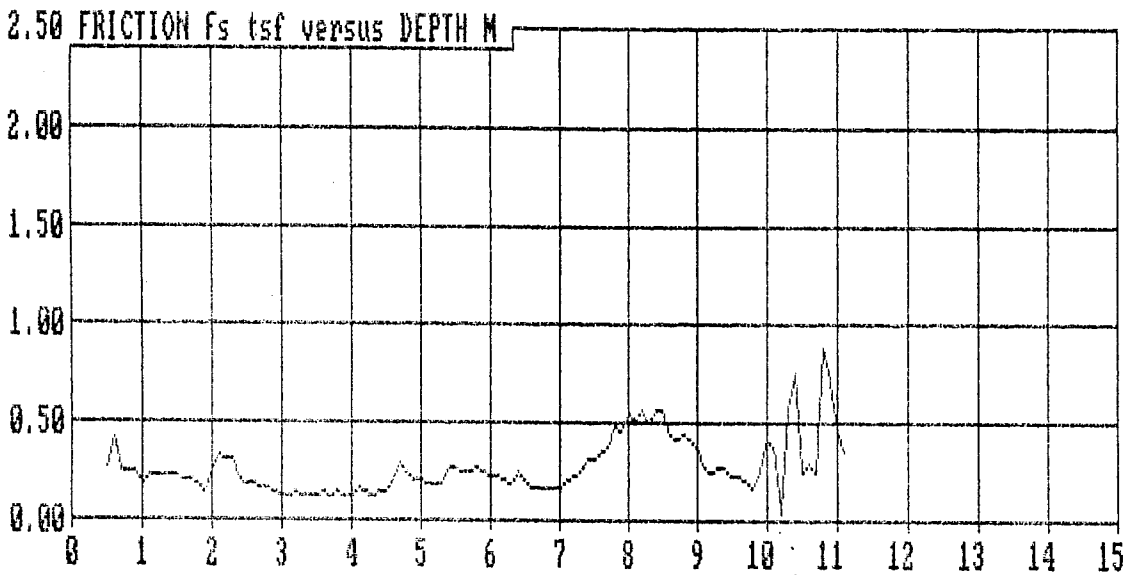
SOUNDING DATA IN FILE SND109 06-30-94 20:07
OPERATOR : S.VAN LOCATION : P-12/BFC-KC-MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



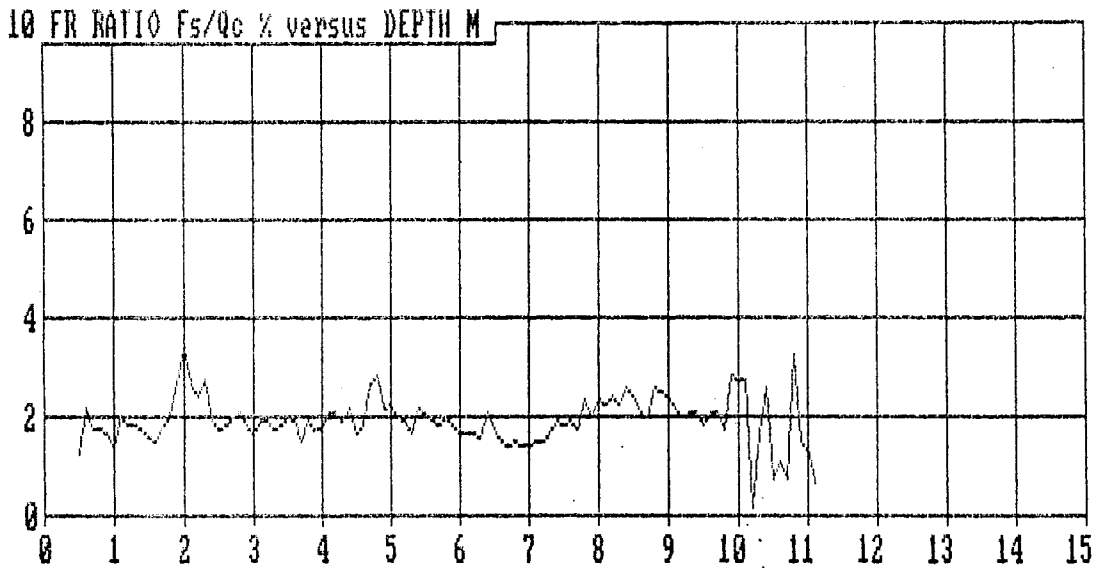
SOUNDING DATA IN FILE SND109 06-30-94 20:07
OPERATOR : S.VAN LOCATION : P-12/BFC-KC-MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



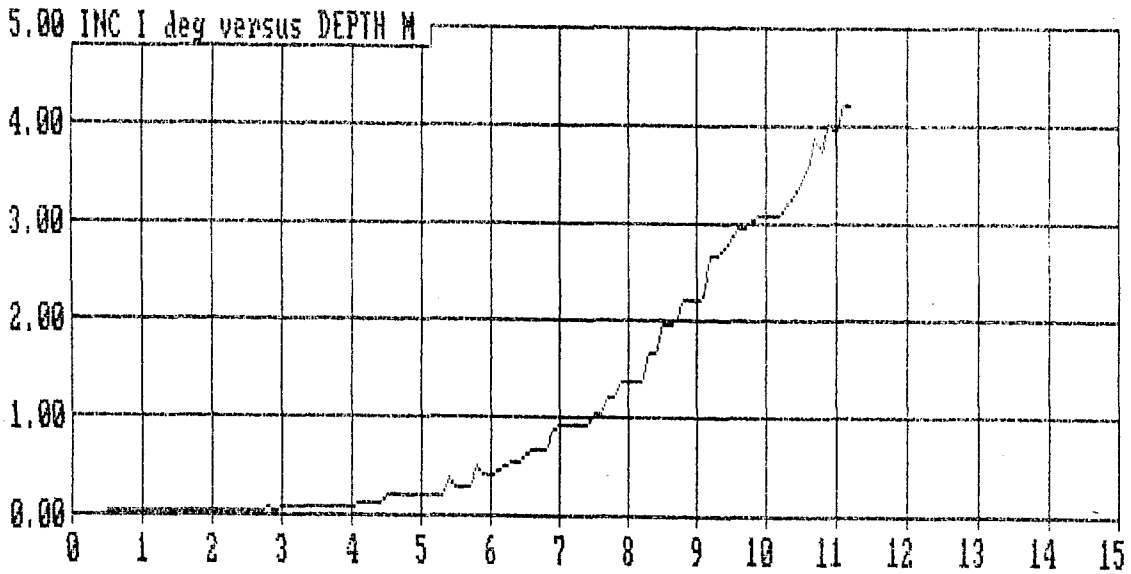
SOUNDING DATA IN FILE SND109 06-30-94 20:07
OPERATOR : S.VAN LOCATION : P-12/BFC-KC-MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



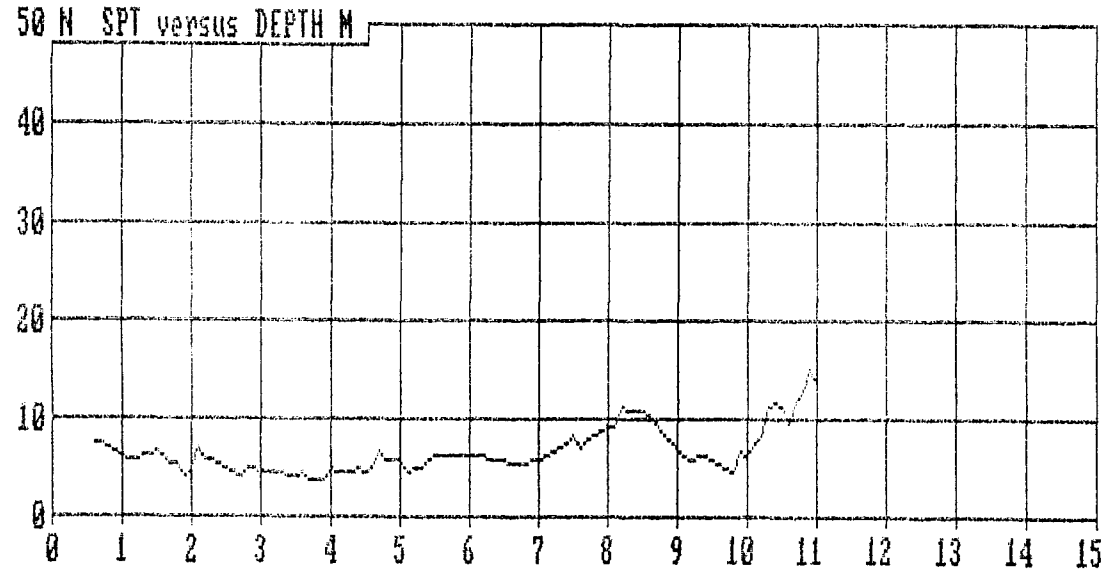
SOUNDING DATA IN FILE SND109 06-30-94 20:07
OPERATOR : S.VAN LOCATION : P-12/BFC-KC-MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261



SOUNDING DATA IN FILE SND109 06-30-94 20:07
OPERATOR : S.VAN LOCATION : P-12/BFC-KC-MO
CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3261

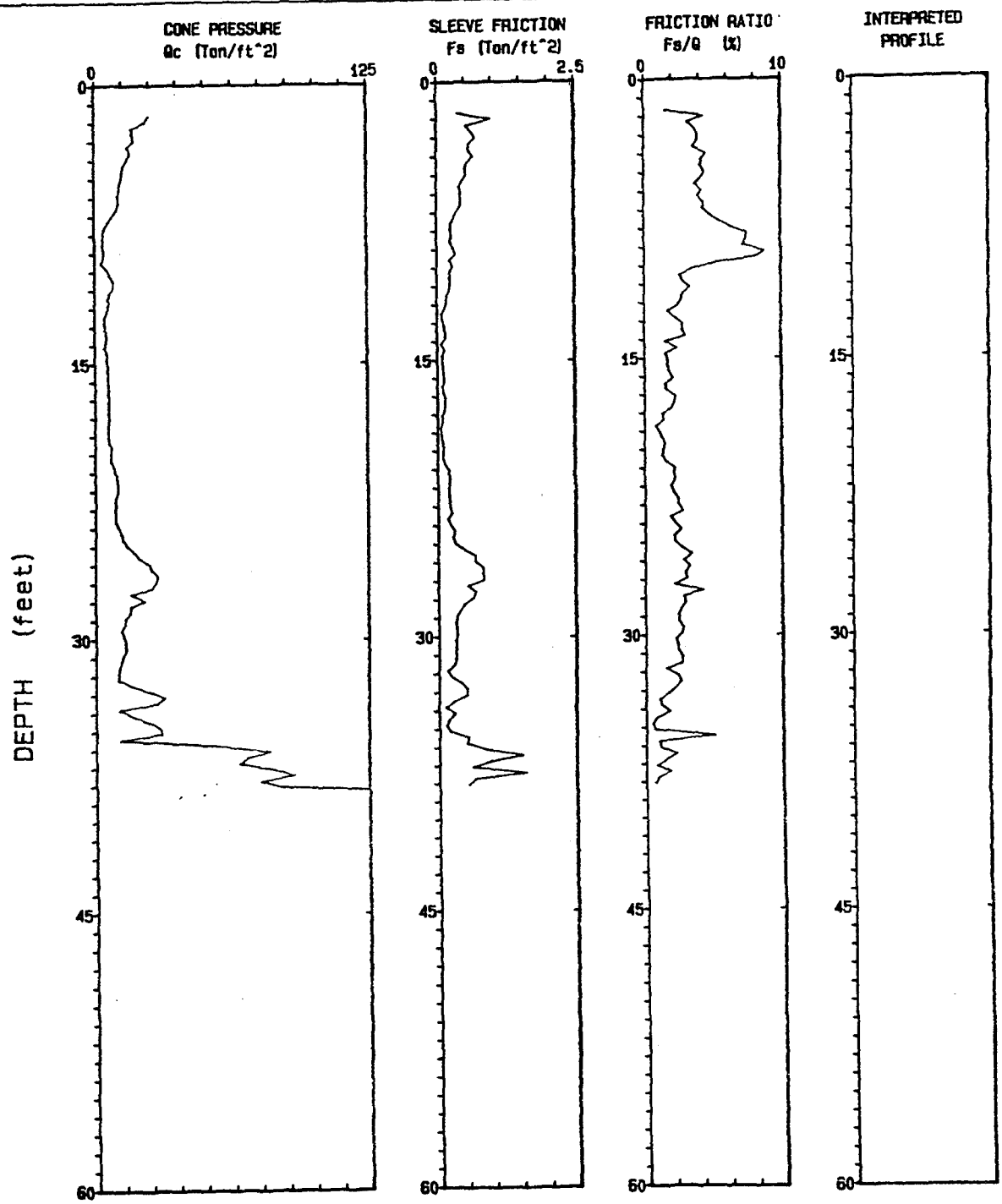


SCPT P-13

Vandehey Soil Expl.

Operator : S.VAN
Sounding : SND110 Pg 1 / 1
Client : WES

CPT Date : 06-30-94 21:30
Location : P-13/BFC-KC MO
Job No. : DACW39-94-M-5062



Depth Increment : .1 m

Max Depth : 38.39 ft

SOUNDING DATA IN FILE SND110 06-30-94 21:30

OPERATOR : S.VAN LOCATION : P-13/BFC-KC MO

CLIENT : WES JOB No. : DACW39-94-M-5062

Vandehey Soil Exploration
40695 Nw Pacific Ave. Banks, Oregon. 97106 (503) 324 3281

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
0.50	1.6	24.9	0.391	1.57	0.1	?
0.60	2.0	23.1	0.990	4.29	0.0	clayey silt to silty clay
0.70	2.3	17.3	0.547	3.16	0.0	silty clay to clay
0.80	2.6	17.3	0.641	3.70	0.0	silty clay to clay
0.90	3.0	18.3	0.711	3.89	0.0	silty clay to clay
1.00	3.3	15.1	0.580	3.84	0.0	silty clay to clay
1.10	3.6	16.5	0.581	3.52	0.0	silty clay to clay
1.20	3.9	15.1	0.682	4.53	0.0	clay
1.30	4.3	13.2	0.551	4.17	0.0	clay
1.40	4.6	12.6	0.516	4.08	0.0	clay
1.50	4.9	12.3	0.537	4.38	0.0	clay
1.60	5.2	11.5	0.471	4.12	0.0	clay
1.70	5.6	11.2	0.419	3.73	0.0	clay
1.80	5.9	10.6	0.442	4.18	0.0	clay
1.90	6.2	11.1	0.432	3.89	0.0	clay
2.00	6.6	10.0	0.435	4.34	0.0	clay
2.10	6.9	8.4	0.363	4.32	0.0	clay
2.20	7.2	6.3	0.304	4.84	0.0	clay
2.30	7.5	4.6	0.249	5.40	0.0	clay
2.40	7.9	3.8	0.243	6.36	0.0	clay
2.50	8.2	3.6	0.272	7.49	0.0	organic material
2.60	8.5	3.2	0.242	7.51	0.0	organic material
2.70	8.9	4.0	0.290	7.19	0.0	organic material
2.80	9.2	3.8	0.334	8.79	0.0	organic material
2.90	9.5	2.7	0.220	8.09	0.0	organic material
3.00	9.8	5.6	0.281	5.01	0.0	clay
3.10	10.2	6.9	0.236	3.43	0.1	clay
3.20	10.5	8.6	0.219	2.55	0.1	silty clay to clay
3.30	10.8	8.5	0.237	2.81	0.1	silty clay to clay
3.40	11.2	6.5	0.214	3.28	0.1	clay
3.50	11.5	5.9	0.162	2.74	0.1	clay
3.60	11.8	6.2	0.166	2.67	0.1	clay
3.70	12.1	5.5	0.128	2.35	0.1	silty clay to clay
3.80	12.5	4.2	0.069	1.63	0.1	silty clay to clay
3.90	12.8	4.3	0.095	2.22	0.1	clay
4.00	13.1	4.7	0.130	2.78	0.1	clay
4.10	13.5	5.4	0.151	2.80	0.1	clay
4.20	13.8	5.1	0.148	2.93	0.1	clay
4.30	14.1	4.0	0.060	1.49	0.1	silty clay to clay
4.40	14.4	5.5	0.126	2.31	0.1	silty clay to clay

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 * sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
4.50	14.8	5.6	0.084	1.50	0.1	silty clay to clay
4.60	15.1	5.9	0.100	1.70	0.1	sensitive fine grained
4.70	15.4	5.8	0.095	1.65	0.1	silty clay to clay
4.80	15.7	5.9	0.102	1.75	0.1	silty clay to clay
4.90	16.1	6.1	0.124	2.03	0.1	silty clay to clay
5.00	16.4	6.0	0.089	1.48	0.1	silty clay to clay
5.10	16.7	6.4	0.100	1.57	0.1	silty clay to clay
5.20	17.1	6.4	0.142	2.22	0.1	silty clay to clay
5.30	17.4	6.0	0.126	2.10	0.1	silty clay to clay
5.40	17.7	6.2	0.117	1.89	0.1	silty clay to clay
5.50	18.0	6.3	0.082	1.29	0.1	sensitive fine grained
5.60	18.4	5.5	0.079	1.35	0.1	sensitive fine grained
5.70	18.7	5.9	0.045	0.76	0.1	sensitive fine grained
5.80	19.0	6.0	0.064	1.07	0.1	sensitive fine grained
5.90	19.4	6.5	0.081	1.25	0.1	sensitive fine grained
6.00	19.7	7.5	0.113	1.50	0.1	clayey silt to silty clay
6.10	20.0	7.2	0.091	1.26	0.1	clayey silt to silty clay
6.20	20.3	7.2	0.089	1.24	0.1	clayey silt to silty clay
6.30	20.7	8.7	0.134	1.54	0.1	clayey silt to silty clay
6.40	21.0	9.3	0.204	2.20	0.0	clayey silt to silty clay
6.50	21.3	10.3	0.220	2.13	0.0	clayey silt to silty clay
6.60	21.7	10.1	0.217	2.16	0.0	clayey silt to silty clay
6.70	22.0	10.2	0.187	1.83	0.0	clayey silt to silty clay
6.80	22.3	9.3	0.194	2.08	0.0	clayey silt to silty clay
6.90	22.6	8.8	0.210	2.39	0.0	silty clay to clay
7.00	23.0	8.9	0.217	2.44	0.0	silty clay to clay
7.10	23.3	9.2	0.247	2.69	0.0	silty clay to clay
7.20	23.6	9.2	0.165	1.79	0.0	clayey silt to silty clay
7.30	23.9	10.6	0.231	2.18	0.0	clayey silt to silty clay
7.40	24.3	11.6	0.303	2.62	0.0	clayey silt to silty clay
7.50	24.6	12.7	0.261	2.06	0.0	clayey silt to silty clay
7.60	24.9	14.5	0.313	2.16	0.0	clayey silt to silty clay
7.70	25.3	17.6	0.471	2.68	0.0	clayey silt to silty clay
7.80	25.6	20.2	0.685	3.39	0.0	clayey silt to silty clay
7.90	25.9	24.6	0.690	2.80	0.0	clayey silt to silty clay
8.00	26.2	25.8	0.827	3.21	0.0	clayey silt to silty clay
8.10	26.6	28.6	0.820	2.87	0.0	clayey silt to silty clay
8.20	26.9	27.9	0.840	3.01	0.0	clayey silt to silty clay
8.30	27.2	25.7	0.536	2.09	0.0	clayey silt to silty clay
8.40	27.6	16.4	0.694	4.24	0.0	clayey silt to silty clay
8.50	27.9	22.5	0.624	2.78	0.0	clayey silt to silty clay
8.60	28.2	16.2	0.471	2.90	0.0	clayey silt to silty clay
8.70	28.5	15.6	0.395	2.54	0.0	clayey silt to silty clay
8.80	28.9	13.4	0.318	2.38	0.0	clayey silt to silty clay
8.90	29.2	12.9	0.309	2.39	0.0	clayey silt to silty clay
9.00	29.5	11.5	0.311	2.71	0.0	clayey silt to silty clay
9.10	29.9	12.9	0.332	2.58	0.0	clayey silt to silty clay
9.20	30.2	13.7	0.297	2.16	0.0	clayey silt to silty clay
9.30	30.5	13.7	0.317	2.32	0.0	clayey silt to silty clay
9.40	30.8	12.4	0.297	2.40	0.0	clayey silt to silty clay

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

DEPTH meters	DEPTH feet	TIP Qc tsf	FRICTION Fs tsf	FR RATIO Fs/Qc %	INC I deg	INTERPRETED SOIL TYPE
9.50	31.2	11.5	0.307	2.68	0.0	silty clay to clay
9.60	31.5	10.6	0.271	2.56	0.0	clayey silt to silty clay
9.70	31.8	10.1	0.153	1.51	0.0	clayey silt to silty clay
9.80	32.2	9.9	0.235	2.37	0.0	clayey silt to silty clay
9.90	32.5	16.1	0.411	2.54	0.0	clayey silt to silty clay
10.00	32.8	24.6	0.517	2.10	0.0	sandy silt to clayey silt
10.10	33.1	31.4	0.506	1.61	0.0	sandy silt to clayey silt
10.20	33.5	27.7	0.263	0.95	0.1	sandy silt to clayey silt
10.30	33.8	10.6	0.126	1.19	0.1	sandy silt to clayey silt
10.40	34.1	16.5	0.287	1.74	0.1	sandy silt to clayey silt
10.50	34.4	24.2	0.174	0.72	0.1	sandy silt to clayey silt
10.60	34.8	28.1	0.124	0.43	0.1	silty sand to sandy silt
10.70	35.1	29.9	0.193	0.65	0.2	sandy silt to clayey silt
10.80	35.4	10.8	0.539	4.99	0.2	sandy silt to clayey silt
10.90	35.8	55.3	0.510	0.92	0.4	silty sand to sandy silt
11.00	36.1	79.6	0.867	1.09	0.3	silty sand to sandy silt
11.10	36.4	69.2	1.530	2.21	0.4	silty sand to sandy silt
11.20	36.7	65.7	0.946	1.44	0.3	silty sand to sandy silt
11.30	37.1	81.3	0.616	0.76	0.4	sand to silty sand
11.40	37.4	90.7	1.594	1.76	0.8	silty sand to sandy silt
11.50	37.7	75.9	0.656	0.86	0.9	sand to silty sand
11.60	38.1	85.4	0.541	0.63	1.0	?
11.70	38.4	174.7	?	?	1.0	?

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .2 m sliding data average

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OPERATOR : S.VAN LOCATION : P-13/BFC-KC MO
CLIENT : WES JOB No. : DACW39-94-M-5862

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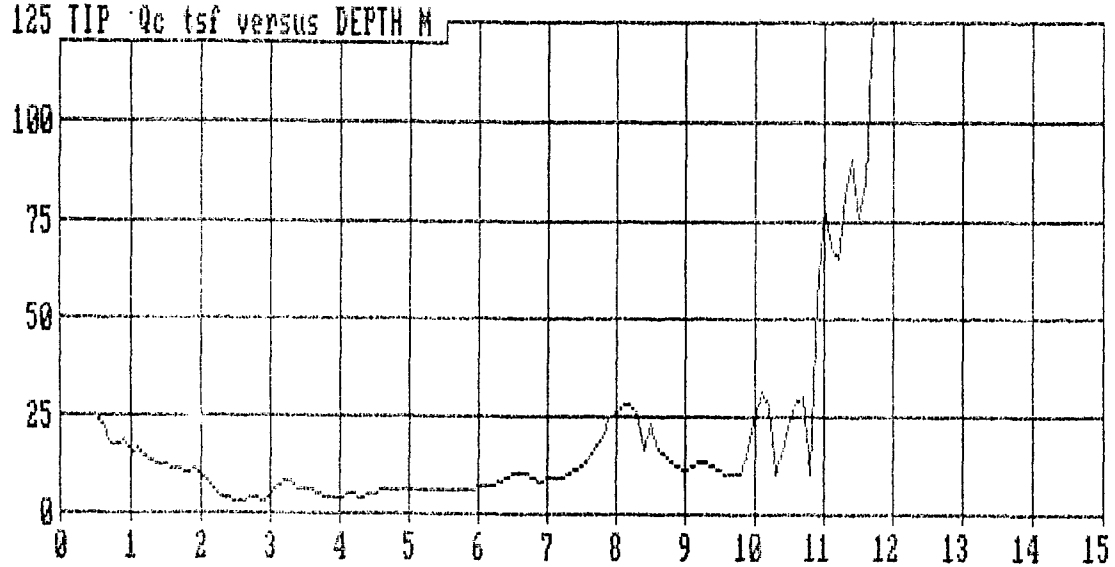

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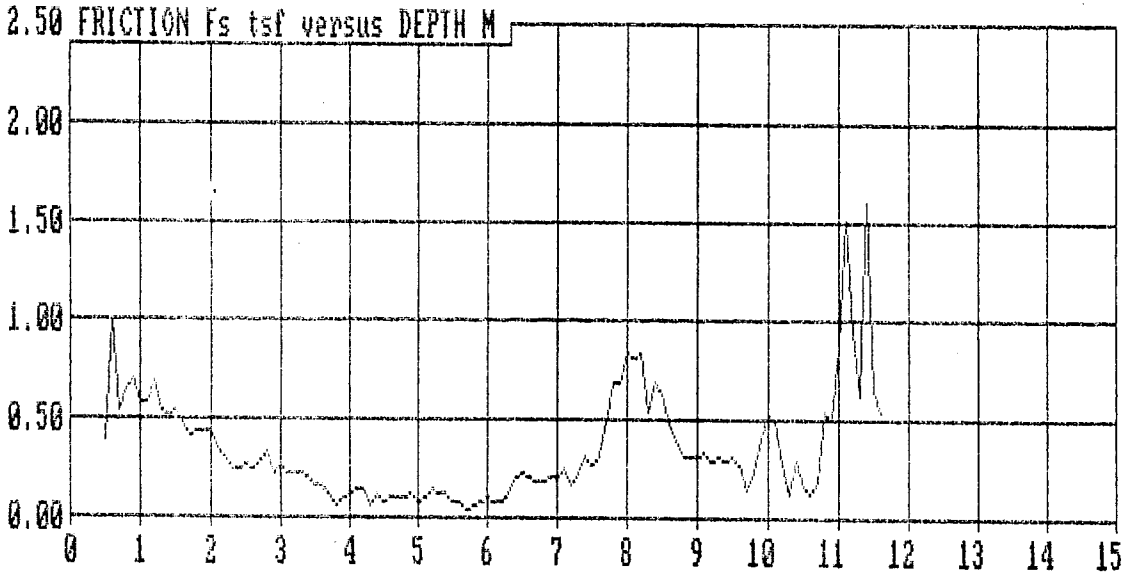

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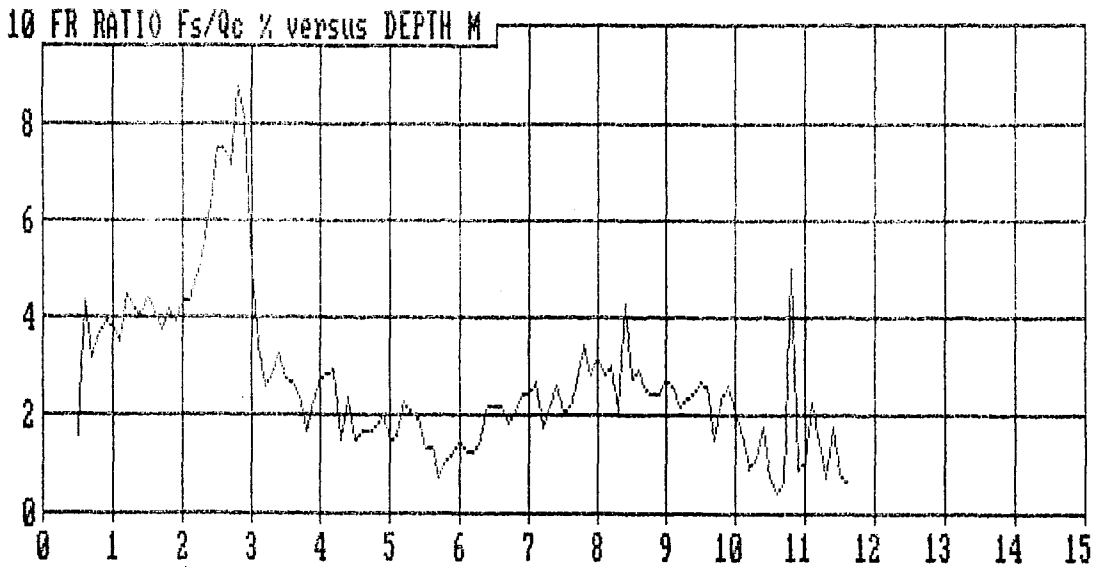

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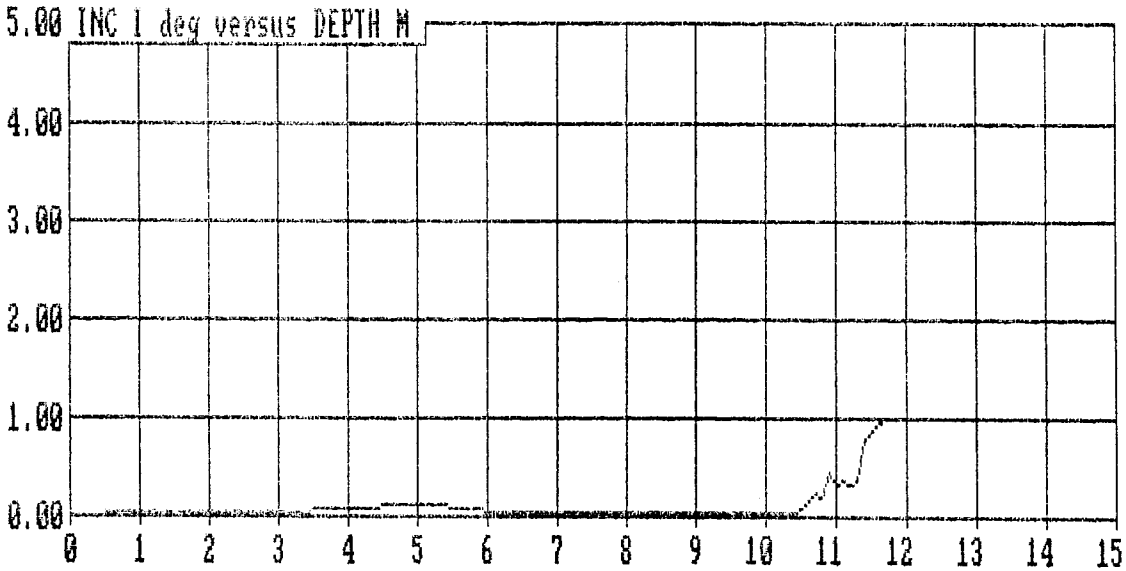

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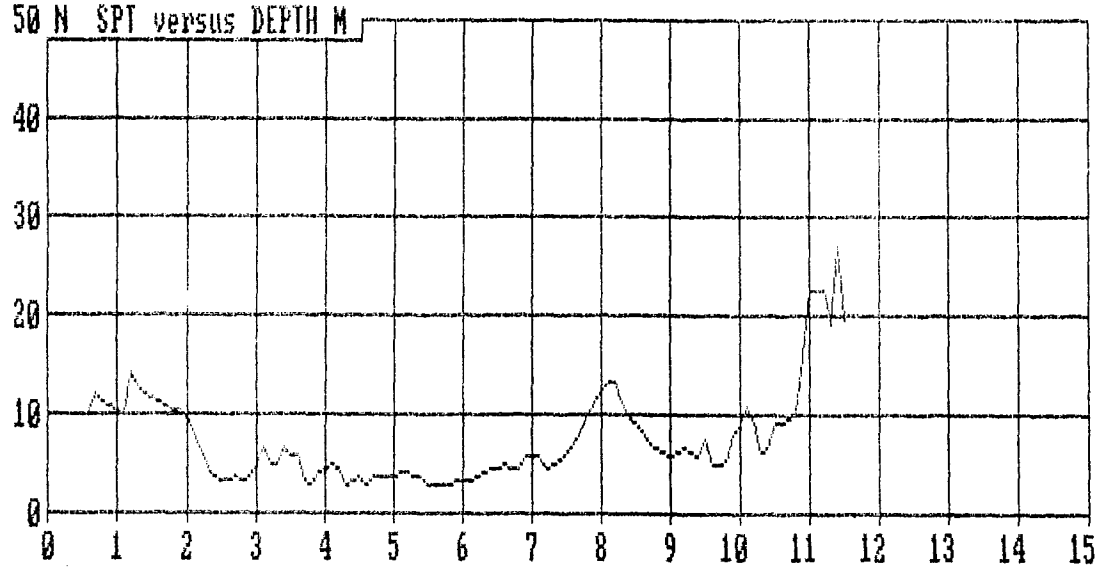

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13. ABSTRACT *(Maximum 200 words)*

An in situ geophysical investigation consisting of crosshole and downhole shear wave (S-wave) seismic cone penetrometer tests (SCPT) was performed at the Bannister Federal Complex (BFC) located in Kansas City, Missouri. The SCPT was also used to collect cone tip resistance and sleeve friction data to aid in characterizing the soils at the site. The results of the SCPT were used to provide a continuous prediction of soil type and N-values. The main purpose of the investigation was to determine the S-wave velocities of the soil and bedrock in the vicinity of the main building at the BFC. This information will be used to perform a dynamic analysis of the building and its foundation. The results of the dynamic analysis will be used to determine if any building design modifications are required.

The S-wave velocities measured for the clay materials (alluvium) using the crosshole and SCPT methods agreed very well. The S-wave velocities in the clay material increased with depth and ranged between 350 and 775 fps. A 1- to 5-ft. thick basal clay-gravel, which overlies bedrock, showed a velocity of approximately 1,100 fps. The Pleasonton Group bedrock found at the site is a hard shaly siltstone and is encountered at a depth of approximately 40 ft. The bedrock exhibited an S-wave velocity of approximately 1,900 fps and was measured using the crosshole S-wave method.

14. SUBJECT TERMS

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